

**THE
CHILDREN'S
HOSPITAL
MEDICAL
CENTER
100TH
ANNIVERSARY**



**ANNUAL
REPORT
1969**

**THE
CHILDREN'S
HOSPITAL
MEDICAL
CENTER**

comprising

*THE CHILDREN'S HOSPITAL MEDICAL CENTER
SARAH FULLER FOUNDATION FOR LITTLE DEAF CHILDREN
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ASSISTANT TO THE GENERAL DIRECTOR

Dr. Lendon Snedeker

The past two years have been ones of great change. In almost all areas, Children's has been proceeding in two apparently contradictory directions: towards a wider scope of operations; and towards greater refinement and depth in each individual endeavor. The key to the seeming paradox is growth: by expanding the physical plant and the complement of personnel, we have been able to do many more things and to do each thing better.

In the four departments under my supervision, these two trends have been manifest. In the Children's Activities Service, the projects embarked upon have increased; yet the psychological sophistication with which each has been done has also increased. Employee Health has added new functions and new thoroughness to longstanding ones. Technological innovations have improved and increased the Visual Education Department's output as needs have grown. And increasing numbers of volunteers have demonstrated great dedication and expertise in the wide variety of tasks they perform.

These are some of the more general features of these two busy and productive years. For more specifics, let us examine each department individually:

Employees' Health Service

1968 has been a somewhat troubled year for the Employees' Health Service. The demands both actual and potential for better health supervision have been increasing constantly for some time. It has been more and more necessary to plan for a service operated under the guidance of a full-time physician so that medical attention might be at hand more constantly. Dr. Harry Stults and Dr. Morton Franklin have been able to see employees at the beginning and end of each working day, but this type of coverage is apt to be spotty at best. Dr. Franklin began his work with the department in 1962 and Dr. Stults in 1965. It has also seemed increasingly necessary to review and sharpen the policies to be pursued in handling the health problems encountered. It was felt by the Administration that some patients were being given treatment for chronic conditions which might at any time call for service out of regular working hours and that these might better be made the concern of outside medical resources from the start. It was also necessary to review the laboratory work done at hospital expense, in view of the hospital's financial position.

The situation became critical when Dr. Franklin resigned in 1968 to take a post at Chelsea Memorial Hospital. Dr. Stults did not wish to further enlarge his participation in the service. The hospital was therefore fortunate to be able to secure the

services of Dr. Hermann Carr, Jr., who had formerly provided occasional vacation coverage for the department. Dr. Carr assumed his duties as Director of the Employees' Health Service on October 7, 1968. Miss Hester Macuen, who has served as Nurse-Administrator of the service since its beginning, continued her customary capable personal services but will be retiring early in 1969.

In all, 7,100 visits were made to the service, 259 employees were referred to outside physicians and hospitals, 6,101 hospital examinations were performed, and 969 immunizations were done.

Dr. Robert MacMillan has continued to act as the Physician to House Officers but the demands on his time preclude his being able to provide service when it is needed over weekends and at night. His duties will ultimately be assumed by Dr. Carr.

Department of Visual Education

There is little definite information at hand about the beginnings of the department. It is however evident that photographic work was done with patients in the early 20th century and probably almost 20 years before that at the time of the hospital's move to the new Huntington Avenue building in 1881.

In 1929 the Department saw and photographed 470 patients. The hospital photographer was Ferdinand R. Harding, who carried on his activities in the basement of the Operating Pavilion, along with the Department of Pathology and the Central Supply Room. Mr. Harding developed in cooperation with the Orthopedic Service a number of special techniques for demonstrating postural and other neuro-muscular deformities. He participated in a long-term cinematographic study of patients with cerebral palsy and related disorders initiated by Dr. Bronson Crothers. In addition, he made possible the many scientific exhibits developed by members of the staff, and was highly esteemed by his fellows, becoming President of the Biological Photographic Association. He also was presented its gold medal Louis Schmidt Award (1953-54).

It is not certain when Mr. Harding's department became formally designated the Department of Visual Education and he its Director. He fully realized that title was far from being realized in actuality but saw it as the goal needing to be reached sometime in the near future.

The Department's activity is best expressed by the fact that 95,788 patients have been seen since the Department opened in 1929, the annual number having increased from 470 to 32,000 this year. The Department does regular clinical photographs, and makes black and white and colored slides. In

1968, 13,215 feet of moving pictures were taken on 202 patients.

The Department has an extensive and priceless collection of 262,500 negatives, well catalogued, including pictures of clinical conditions now unknown or extremely rare. These have occasionally been sold to other institutions, especially schools of nursing, for teaching purposes.

In 1968, after almost 40 years of service, Mr. Harding died. He has been succeeded by Mr. Robert F. McEnany, a well-qualified and experienced man whose primary goal will be the gradual development of a service offering to the staff a full range of audio-visual aids.

Children's Activities Service

The evolution of the Children's Activities Service has been a lengthy process, mirroring changes in the attitudes of the staff as to how best to meet the emotional and physical needs of the hospitalized child in an environment constantly growing, diversifying its activities and multiplying the number of people dealing with the individual patient.

Sometime in the late 1940's there was inaugurated a Department of Occupational Therapy with academic connections with the Boston School for Occupational Therapy and a full-time Director. The Department was housed in the basement of the old Infant's Hospital building and the staff consisted mainly of volunteers recruited through Miss Mary Roemer in the office of the Women's Committee. From 1950-1951 the Director was Miss Eleanor Albertson who first began an organized program. Its emphasis was largely recreational (i.e. diversional) and there was very little inter-relation with the Department of Physical Therapy in the field of functional therapy. The affiliation with the Boston School was gradually dropped because the hospital program did not fulfill its expectation or meet its conception of what Occupational Therapy in the hospital should be like.

Miss Marjorie Button succeeded Miss Albertson in 1952 and was assisted in the recreational part of the program by Miss Mabel Bell. At this time a program was instituted at the Hospital and Convalescent Home in Wellesley Hills for patients in the Respirator Unit. This came under the direction of Miss Auberte Boulais who was succeeded by Mrs. Gloria English who continued with the Unit until it moved to the House of the Good Samaritan.

In 1954 Mabel Bell took over for Miss Button and was assisted by Miss Maureen Sullivan. A considerable recreational volunteer program was operated throughout the hospital but there were doubts as to what the future of this activity might be and

what should be its scope.

About this time, Dr. Dane Prugh left the hospital to go to Rochester, N. Y. and with him went Miss Sally Staub who had collaborated with him in studies of the effect of hospitalization on children on the Medical Service. When she left in 1953 Miss Staub submitted a report on her activities which was highly critical of the status quo and yet stimulating. A Staff Committee, the Committee on Recreational Services, was appointed, and after considering the Staub report decided that a better designation of its function would be embraced in the title of Committee on Patient Education and Recreation. It was so designated from January 1958 to September 1966. There was a feeling that this area of hospital activity should be concerned with child education and use educational workers in carrying out its program. A study seemed indicated, and through conferences with Harvard Graduate School of Education Miss Margaret Linnehan, on sabbatical leave from the Boston School system, was secured to carry one out on the hospital and its patients so as to elucidate what direction the future hospital program should take.

Miss Linnehan strengthened the feeling of the Committee that there should be considerable educational emphasis in the program. Their deliberations led to the appointment of Miss Joyce (Langley) Meyer, a happy combination of registered nurse and nursery school teacher, as Coordinator of the Department. She was initially financed through a grant from the Child Study Association of America. Miss Langley's background was extremely helpful in securing the cooperation of the Nursing Service. Student nurses were given instruction in recreational techniques and students from a number of outside colleges began to come to the hospital to work for credit. During this period attempts were made to develop classroom programs using the teachers supplied by the Boston School Department. This was not successful largely because the teachers available had for too long been accustomed to doing only bedside tutoring. For a short period in 1960 Mrs. Eva Pahnke at the House of the Good Samaritan carried on an independent program, but concluded that the age range of patients was too great and too constantly shifting to permit a regular program.

In 1959 Miss Langley, now the wife of Dr. Roger Meyer, left the hospital to raise a family. She was succeeded by Mrs. Barbara Patterson a nursery school teacher of broad experience and great creative energy who carried on with Mrs. Meyer's basic program, but began to utilize her assistants to make

observational studies on young patients. They met regularly, first with Dr. Tully Beneron and later Dr. Charles d'Autremont of the psychiatric staff, for indoctrination in childhood behavior, development and observational techniques.

Mrs. Patterson's program was now strong enough to warrant General Funds support. Her staff numbered about 15 young women, usually with training in education child development, who came to be designated Child Activity Specialists. The program was retitled the Children's Activities Service. In May of 1965 a conference for hospital recreational workers drawn from major children's hospitals in the eastern half of the country was held at the hospital. It was the first such meeting of its kind, well attended, and led directly to the organization of the American Association for the Care of Children in Hospitals.

Mrs. Patterson resigned from the hospital in the spring of 1968 and an Ad Hoc Committee has been deliberating about the future program and its Director up to the present. In this interim period, Miss Julie Snow and Miss Myra Fox have been very capably acting as co-directors.

Department of Volunteers

Ever since there has been a Children's Hospital there have been volunteers. In his letters to Mrs. Adeline Tyler in 1869, even before the hospital was opened, Dr. Francis Brown listed the donations of linen, diapers and bed clothing which volunteers had made. For many years the annual hospital reports meticulously listed gifts of this sort down to the last little stocking or jam jar. The Nursing Department began with a core of lady volunteers, later supplemented by young women who underwent a rigorous course of training before receiving their diplomas.

From the very first the hospital's founders had stressed as one of their aims the betterment and gentling of the hospital's young charges. Volunteers played a part in those activities promulgated at the hospital to this end. The Ladies Aid Association, which was responsible for founding and supporting the Convalescent Home, was in a sense the forerunner of the present Women's Committee and both represent organized volunteer effort on behalf of the child. But these were not directly concerned with care or play at the bedside.

We know the volunteers started work in the Out-Patient Department as early as 1909, and that Mrs. Thomas (Gertrude) Lanman participated there in 1918 as a representative of the Women's Committee and Director of Volunteers. At that time there was only one graduate nurse on duty in the clinic and

volunteers were depended upon to change dressings, take medical histories, bandage fractures after they had been splinted, even to instruct student nurses. Mrs. Lanman was succeeded after a time by Mrs. Edwin Cave.

In October of 1944 Mrs. Russell Novello became Director of War Service Volunteers.

In the later 40's and early 1950's Miss Barbara Frost served as Secretary to the Women's Committee and was assisted by Miss Mary Roemer who was in charge of Volunteers. Miss Frost left in 1954 and was succeeded for a short period by Mrs. Dorothy Rutherford.

As the number of volunteers increased and their work assignments became more varied, an organization was needed which would be more responsive to the overall administrative needs of the hospital. This was part of a nation-wide trend following the war.

In 1956 Mrs. Kathleen Higgins was appointed Director of the Volunteer Service when it became part of the formal hospital organization. She managed the recruitment and deployment of volunteers of varying ages. She was also administratively responsible for the Lunch Shop and the Gift Shop which were manned by a good many members of the Women's Committee and whose monies were credited to the various fund-raising efforts of the Women's Committee. One hospital department which relied heavily on Mrs. Higgins for support was the Department of Patient Education and Recreation, previously the Occupational Therapy Department, and very recently re-christened the Children's Activities Service.

In 1968, Volunteers numbered 1,146 and engaged in 33 different kinds of hospital activity. In addition to their work in the Lunch Shop, the Gift Shop, The Thrift Shop and the Yankee Bookstall, all regular activities of the Women's Committee, they served in many other ways. They played hostess in the Recreation and Admitting areas. They worked in the Blood Bank, the Laboratory, the Plaster Room and the Poison Information Center. They devoted over 6,000 hours to escorting patients about the hospital. Their biggest time contribution, 17,627 hours in all, was in the area of Recreation where they worked for the most part under the supervision of the Child Activity Specialists on the various hospital divisions. One very devoted senior group has been meeting weekly for many years making special dressings for the surgical and neuro-surgical services. The year's total of 45,163 hours represents a tremendous gift of devotion to the hospital, its parents and their children.

DEPARTMENT OF FISCAL AFFAIRS

Walton E. Devine

One hundred years ago, when the Hospital first opened its doors, its financial life was simple and uncomplicated. Near the entrance a small polished wood coin box was available for any contributions a person wished to leave. With these gifts and the support of a small group of interested citizens, operations began with 20 beds for the children.

Much has happened during the intervening century, and today Children's Hospital stands in the forefront of institutions of medicine. With this growth the financial operations have expanded until today the quivalent of an estimated 2000 persons serve the patient needs, render training for many medical and technical disciplines, and conduct research in multiple areas of medicine. All this interplay has required a complex financial system and at the present approximately 140 employees are needed to handle the functions of patient services billing, accounting, purchasing, computer operations, property fiscal management, systems and methods design, general stores delivery and inventory control.

The fiscal year, which closed September 30, 1968, reflects the management of an estimated \$31,900,000 during the year. Of these funds, the following listing outlines the general areas of use:

Salaries, wages and employee benefits	\$21,900,000
Supplies and other services	6,400,000
Research and special projects	5,700,000
Capital construction and equipment	6,900,000
	<u>\$31,900,000</u>

Compared to the 20-bed beginning, the present day Children's is a goliath and far beyond the concepts of the original founders. They would, however, look with approval of this modern day center of health care as an extension of their original plans for a leadership position in caring for the youth of the world. It is difficult to compare the changes that have transpired from the days a century ago, when a small box at the entrance handled the funds contributed to the support of operations. Since its original beginnings, many corporate changes have taken place and organizations that grew up around the original hospital have, over the years, agreed to combine their efforts with ours. From these mergers has emerged the complex called The Children's Hospital Medical Center which continues the principals and purposes of the affiliating organizations within a single corporate arrangement. These incorporations, enlargement in scope of service, a major effort in research and teaching, and many other similar moves to expand involvement in health care for the present day world, have placed

the modern day Children's to the forefront of hospital operations. Even a summary of the most recent 30 years' of existence creates an operational comparison that is somewhat breathtaking. The following figures will indicate the growth in service and facilities that has taken place in this short span of 30 years.

The year just passed (1967-1968) was the most active in the history of Children's. During this period the opening of the Fegan Memorial Outpatient Center established a new attitude towards coping with the human problems of health services. With grant assistance from the U. S. Public Health Service, the first steps were taken towards using a computer to assist in scheduling clinic appointments and improved use of available space and effort.

The Residential Complex project on the corner of Longwood and Brookline Avenues was opened during fiscal 1967-68 and with it our belief in another new approach to health care came into being. Within this complex are hotel and restaurant facilities to provide for lodging of parents and patients from distant communities attending various clinics and services of the medical center. More recently negotiations have been completed with Massachusetts Blue Cross to provide accommodations to patient and parent following intensive hospitalization, but prior to release to home. This new study project is planned to reduce the time of the hospital stay by transferring the patient to the parent's care. The per incident cost to the paying party is expected to be reduced appreciably, the total length of stay (both in the hospital and the Inn) would be no greater than at present, and the hospital would gain by having available more beds for patients in need of acute hospital care.

During the biennium since the last departmental report, major efforts have been undertaken to review all services within the Fiscal Affairs department with particular emphases upon creating a strong, well-coordinated business organization to face the constantly increasing pressures upon the modern day hospital and its operations.

The Controller's office, responsible for general and special fund accounting, has been strengthened, and with the leadership of Mr. Paul Broughton reflects constant improvement in the control of the accounting function.

The Patient Billing and Credit functions under the management of Mrs. Stanley Bocon continue the assault against the pressures of collecting for services rendered at a time when more and more

Federal, State, and local involvement in supporting patient service recovery has complicated collections. The results gained by Mrs. Bocon and Mr. J. Donald Richards, Supervisor of Outpatient Billing Services, in collecting for patient care billings cannot go without comment. They have constantly followed the problems related to the medical assistance program of the government and through their understanding and cooperation with representatives of many agencies met with success.

Mr. Richard Crowley assumed the position of Director of Purchasing shortly before the close of fiscal 1968, and with his guidance a reorganization of purchasing procedures and techniques is underway. Mr. Crowley has also assumed administrative responsibility for the General Stores operation with Mr. Robert Granger as Supervisor and the Printing Service with Mr. Salvatore Caliguri as Manager.

The past two years have seen a major change in the operations of the Hospital Data Center. Some months ago, Mr. David Campana was appointed Manager, under the administrative supervision of Mr. Webster J. McKnight, Associate Director for Fiscal Affairs. A management decision to increase computer capacity led to a change in manufacturers and the resulting complex redesign of all systems has created enormous pressures on the dedicated personnel of this department. Along with the revisions of programs described above, the Hospital Data Center assumed responsibility of programming the newly designed clinic appointment scheduling system that became operation in February, 1968. This program was authorized and supported by a three-year grant program of the U. S. Department of Health, Education and Welfare (PHS), and is currently well into its second phase.

During March, 1968, the first doors opened at the Residential Complex and before the fiscal year ended, all units were functioning well. The multiple problems of opening the commercial areas, restaurant-hotel, apartment, dormitory and parking garage were the responsibility of Mr. Josiah Morrill, Assistant Director for Auxiliary Operations, and his assistant Mr. Thomas Halloran, Manager of the operations. They, together with the management of The Marriott Corporation, made possible the establishment of a smooth functioning operation. No newly-opened operation is totally free of difficulty, and this major undertaking has been no exception. However, we have confidence the goals as established by the Board of Trustees will ultimately be achieved and this beautiful center will take its proper place as another dramatic example of a forward-looking approach to health care.

At the close of this past fiscal year, a major evaluation of financial operations indicated the need for improved internal review, and as a result Mr. John Verryt was appointed Assistant Director for Fiscal Affairs with primary responsibility for operational reviews within the medical center and also the daily control of the budget. He, along with Miss Margaret Meenan, work with Mr. McKnight to strengthen the administrative functions necessary to carry out the policies and procedures as established.

During the past biennium there has been a renewed vigor on the part of all personnel within the Fiscal Affairs area. Each problem has been met with cooperation on the part of those concerned, and an increasing willingness to work together to meet and overcome the many issues that are the major challenges in the hospital-health care of this the present century.

	1968	1958	1948	1938
Cost of hospital operations	\$21,800,000	\$6,100,000	\$2,200,000	\$ 588,000
Value of facilities (net)	31,800,000	8,400,000	2,100,000	2,900,000
Cost of research, special funds	5,700,000	2,100,000	250,000	N.A.
Beds available	343	354	360	283
In-hospital patient days, per year	113,320	90,161	82,781	79,654
Outpatient visits, per year	174,000	85,615	56,231	64,380

DEPARTMENT OF GENERAL SERVICES

Rudman J. Ham

One of the most rewarding elements of an administrative post at Children's is the hundreds of professional visitors we entertain each year. These visitors may be Japanese engineers, Swiss medical directors, Canadian suregons, Australian hospital administrators, Swedish architects, Turkish dietitians, English pharmacists, South American students of hospital management, Trustees of other children's hospitals, or many other interesting people from near and far. The time consumed by these visits, which is considerable, is a part of the price Children's pays for leadership.

If we were to take the reader along with the Swedish architect on a tour of Children's we might first go by elevator to the twenty fifth story of our new apartment building. There we would see and describe how our Planning Office, headed by Mr. Arthur Stomberg, has been working closely with trustees, medical staff, and architects for the past five years to realize the goals and objectives laid out on the successful REACH program. Thirty three million dollars worth of new construction or major renovations have either been completed or are actually underway in this brief period. The visitor would notice the proximity and growth of our sister hospitals and we would underline the *urgent* need for cooperative planning with these institutions, as well as with our city. Crowded streets, inadequate parking, and an incomplete public transportation system threaten to choke off the very usefulness of these great institutions.

After descending from the apartment tower we would walk past the seventeen story Basic Pediatric Science Building now under construction and already the subject of considerable interest by planners from other health and educational institutions. Occupation of this \$13,000,000 building is scheduled for the summer of 1970. Our Swedish friend would no doubt be snapping colored pictures as we walked (although not as many as his Japanese counterpart).

We have a choice of several eating places within the Hospital complex, collectively serving more than 1,000,000 staff and visitors per year. Our choice today might be the Fegan Snack Shop, a new area planned in response to the growing hamburger and french fries market. This shop, is operated by Miss Maxine Gilson, Director of Dietary, who works with a staff of 90 people to provide food for Hospital personnel and also attends to the more important function of catering to the special dietary needs of our patients. Miss Gilson must also look ahead to the many new technical advances opening up in the preparation, preservation, delivery and service of food to those patients. Here we might, as we usually

do, gain many useful ideas from the experiences of our visitors.

Along the way, we would likely bump into Mr. Robert Lockerman, Manager of our Housekeeping staff of 120 people. Our visitor, if he is typical, would have already commented on the clean (although cluttered because we are busy) appearance of the Hospital. Mr. Lockerman would tell him with pride of the number of Housekeeping employees whom he has encouraged to attend school and/or seek promotion to other jobs within the Hospital so they might look to a better future in the growing health industry. We must expend more effort in encouraging this type of advancement.

Mr. John Clemons, our Plant Superintendent, bears the responsibility of maintaining our building and grounds and the increasingly complex machinery and equipment within them. Our visitor, if he is interested, could be taken to the mechanical rooms, transformer vaults, emergency generators, and elevator control rooms; shops that many of our own staff, although dependent upon them, have never seen. The day is over, we bid our visitor goodbye, arm him with pamphlets, brochures, plans, etc., and promise to visit him in Sweden some day.

Our next visitor is from London and we ask Mr. John Skinner, our Assistant Director for Communications and Supply, to be his host. This visitor holds Coveted Churchill Fellowship for one year study in Hospital Administration in the United States.

Mr. Skinner might first choose to show him our Communications and Message Center. There he could sit and listen to the several hundred telephone and radio requests for services and supplies of all types, as they are received from the many divisions, clinics, and offices throughout the Medical Center. All of this activity in addition to the telephone switchboard in the Communication and Message Center is under the direction of Mr. Howard Bronstein.

Also of interest to our English visitor would be the Pharmacy (Apothecary) headed by Mr. Arthur Thompson. Mr. Thompson would point out pharmaceutical practice in a hospital setting, particularly in a pediatric, teaching, and research institution, is vastly more complex and interesting than that of his retail or even his community hospital counterpart. Nearly \$1,000,000 worth of drugs are dispensed here each year by several registered pharmacists.

Miss Edith Bell, R.N., has for many years headed our Central Sterile Supply. Sharply increased activity in this department reflects both the growing

number of children seen on Surgical and Medical Emergency Wards, as well as a substantial increase in demand of the Operating Rooms. Our visitor might comment that he has seen substantial automation in other hospital's Sterile Supply departments. Children's will, as soon as building plans allow, follow this pattern.

If our guest wonders who moves all of the supplies, mail, linen, food, etc., around the Hospital, he would be introduced to Mr. Thomas Duff, whose 20-man distribution team goes night and day to keep supply quotas full. Continual refinement of supply quotas in all of the divisions, clinics, and departments will lead to further systemization of the Distribution Department and, of course, to reduction of cost.

Although Children's actively participates in a joint laundry with 18 other institutions, it is necessary to maintain an active internal linen and uniform service department. Several thousand uniforms must be issued and collected and new employees must be fitted. Seven days a week linen carts must be pulled from each Nursing Division and replaced by one filled to quota for the next 24 hours. Mr. Frederick Brown, our Linen Manager, must

also be responsible for maintaining adequate inventory levels on more than two hundred linen items.

Security requirements for hospitals vary greatly from one location to another. Mr. Richard Carroll, our new Security Director, would describe to our visitor how a multi-building plant such as ours, located in a large urban setting, must have a capable Security force to protect it from burglary, vandalism, and the inevitable fire hazards for the general reassurance of the many professional staff who work the long weekend and evening hours. Mr. Carroll also must cope with the problem of accommodating more than 2,000 oversized automobiles which arrive at our institution each day. Our English friend is blessed with fewer and smaller vehicles.

It is rare when one of our many guests does not comment on the friendly atmosphere and excitement which seems to permeate the entire Medical Center. This is perhaps normal in a hospital that cares for children, where there is the natural enthusiasm of students, or where there is the anticipation of breakthroughs in research. Children's has spent 100 years developing this atmosphere, so perhaps it has more than most.

DEPARTMENT OF PATIENT SERVICES

Richard D. Mills

In this, the second report from the Office of Patient Services, it is fitting to note several major developments during the past two years. In August 1967, the Fegan Memorial Outpatient Center was opened for patient care. Throughout the structure and in the operation of the outpatient services, our goal is to develop and provide modern concepts of ambulatory care. At present, the patient is seen on an appointment; the dignity of the patient is recognized with modern facilities and surroundings; and the role of the nurse embraces, to a far greater extent, the coordination of services to meet the total medical needs of the patient. The computer is being exploited to support the patient, and will in time contribute a great deal to improve the total care of the patient. Of basic importance is the dedication of this entire eleven-story building to this phase of ambulatory care.

The space formerly occupied by the outpatient clinics is now being remodeled for a greatly enlarged and modern emergency service and an ambulatory surgical suite. This is a non-appointment service, available to anyone walking in, 24 hours a day, seven days a week. A new admitting area is already in operation. In each new structure utmost consideration is being given to the needs of the patients seeking care.

Ambulatory care which historically has been of secondary importance will be able to play a major role in the total services of the Medical Center.

In cooperation with the Rindge Technical Institute of Cambridge, an approved training program for Medical Record Technicians has been started. The first class of nine has already completed the 11 months' program. The graduates, all readily employed in hospitals in the area, show evidence to the need for and the standards of this program. As the health manpower needs become more and more acute, the function and role of the Medical Center as an educational institution becomes even more significant.

We are very concerned with the lack of space in many areas of patient care activity. Many of our diagnostic laboratories, the radiology and nuclear medicine facilities, and the surgical appliance shop have less space than needed to properly serve the increased demands brought about in part by the increase in patients seen on the ambulatory care units. In Radiology, for instance, 48 percent of the patients are ambulatory.

The Office of Patient Services, organized in September of 1965, includes the Director; the Assistant Director, Mr. Davis S. Weiner appointed in August 1967; and Mr. Charles A. Benedict, Administrative

Assistant. Mr. Terrence Forde has been appointed jointly with Dr. Sidney Farber as Administrative Assistant in the Clinical Laboratories; and Mr. John Bracken has been appointed jointly with Dr. E. E. D. Neuhauser as Administrative Assistant in the Department of Radiology. In making these departmental appointments, we have recognized the need for increased administrative support for the major role played in the Medical Center by these two departments.

In November, 1967, the hospital accepted its first Administrative Resident. Mr. Michael Geaney completed his training in the Yale Medical School Graduate Program in Hospital Administration and was with the Office of Patient Services for a five months' residency ending in June, 1968. Mr. James A. Bromiley from the University of Iowa Graduate School of Hospital Administration came in July, 1968, and will complete his one year residency in June of 1969.

While the Office of Patient Services is related and functions administratively in regard to various departments of the medical center, it must in fact be oriented towards the patient and of primary concern with the role of the hospital in meeting the hospital's responsibilities to its patients and to the broad community it serves. It is, therefore, fitting in this 100th anniversary report to consider and to project a future for of Medical Center.

History Reflects Changes

The history of The Children's Hospital Medical Center in its areas of patient care and patient services reflects (1) the tremendous advances in medical sciences in curing disease; (2) the development and growth of associated physical, behavioral and social sciences; (3) a high degree of compassion and concern for those less fortunate by those who first organized the parent institution; (4) all who over the years have supported financially and in dedication the various programs of teaching, research and patient care; and (5) the increase in concern by the individual citizen with his own well being. The following are but a few of the historical events in the development of the Medical Center which give evidence to these points.

Shortly after the hospital opened in 1869, the Ladies Aid Committee established the Convalescent Home in Weston, Mass., as a means of providing long-term care for patients in the hospital. The Home accommodated six children and was not opened in the winter.

The Physical Therapy Service was established some 75 years ago with volunteers to care for pa-

tients in the newly established scoliosis clinic. At that time, parents were not taught to give home care. Instead, the child was required to attend the clinic for his long-term therapy or yield to someone on the long waiting list. In 1914, physical therapy was offered to inpatients and today 78 per cent of all treatments are with the hospitalized patients.

What now is the Surgical Appliance Shop had its beginnings in 1884 when one "mechanic" was hired for the manufacturing of splints and apparatus. It was the first such shop in Boston and enabled patients to be fitted on the premises. Over the years, quality and standards have increased in orthopedics under the leadership of the American Association of Orthoptists and Prosthetists. A certifying examination is required in biomechanics, anatomy, disease entities and all phases of brace making.

The Medical Records Department was organized as a means of centralizing the cataloguing and classifying of data on the various diseases and illnesses of the patients. The accumulation of factual data concerning the cause of disease and treatment of patients has enabled those engaged in clinical research to make significant major contributions.

The Social Service Department was organized as a means of assisting patients and their families during periods of illness. It was then recognized that physical illness is interrelated both in cause and effect with social problems and individual adjustments. As our society has become more complex, the social worker has played a major role in the total care of the patient.

Established to meet a functional need, these departments have participated and contributed to the over-all enabling force of the institution which has been dedicated to the diagnosis and study of disease and illness. They have been and are continuing to perform a major service in the total care of the patient who is admitted to a hospital bed or who attends one of some 54 outpatient clinics.

What of the Patient?

But as these functions and many others were added and as our Medical Center expanded, what of the patient, what of the recipient, what of the person to whom we basically are dedicated? For many years, a person or child with a serious illness, abnormality or disease was faced with a long-term disability which at best might be contained through long periods of convalescence and chronic care. This type of care was a major function of our original hospital and outpatient clinics.

Today the patient sees the hospital as a place where more and more his illness, abnormality or

disease will be cured and he will be returned to a healthy status. His fears and apprehensions are recognized and effort is made to understand his needs.

What was once organized out of compassion by a few has become a major element in the life of all individuals. At one time, illness was the concern and function of only a small segment of the population. Today, it is a major factor in our entire economic, social, and political life; and the modern hospital or medical center has become the major resource to turn to whenever a person is threatened by pain, distress, or possible death. Last year over 66,300 visits were made to the "walk in" emergency clinics of the hospital. Of these, only 2 per cent were classified as true emergencies, 80 per cent as urgent, and 18 per cent as routine.

It has been proposed that medical care, as we have seen its development, is in fact "sick care"; and hospitals as institutions generally are concerned with (1) the repair and return of the individual to a normal health status, and/or (2) containment of illness or disability to a minimum. If we are to meet the real needs of the people, we must also be concerned with a third function: that of normal growth and development, including the prevention of disease and illness. In this context, medical care should be only a part-time activity within a total field of health care. What has been our concern with an illness episode should be only a part of a broad effort in supporting the individual's total health status.

There are many who state the modern medical center, as it has developed, will not be able to take a leadership role in a concept of total health, since such institutions are polarized in their present medical care role. Hospitals, representing the institutionalization of systems, facilities, and people, are concerned only with patients and not the citizen in the community who is not at the time experiencing any interruption to his life style. Such an evaluation is well supported and historically true.

However, with the hospital already the focal point for at least a major share of the total spectrum of health care, they offer the best visible potential for assuming this broader role. There is no other institution, agency, profession or element in our society today that is as well staffed with competent and knowledgeable personnel or has the facilities or capabilities for carrying out the concept of total health care.

Changes Required

It is recognized that many changes will be required, both in our established systems of medical

care and in the cultural systems of the individual in our society. Medical education will have to recognize both systems. Our methods of financing "sick care" will have to include an acceptable means of financing health care as well. And of major importance, the individual whose expectations are increasing must be willing to accept a responsible and participating role in his total health program. These are only three problem areas; there are many more.

While there must be many modifications, partic-

ularly among special interest groups, the soundness of the concept of total health care, socially, politically, economically, versus that of "sick care" can not be denied. Since it is probably true that anything worth doing is worth doing, even poorly, we can not wait for ideal solutions. As medical care and medical centers have developed in the past, so we now must move ahead on new pathways if we are to meet eventually the challenge of total health care.

DEPARTMENT OF ANESTHESIOLOGY

Robert M. Smith, M.D.

Anesthesia was administered by nurse anesthetists throughout much of the development of the specialty of pediatric surgery at Children's Hospital, and it was Miss Bess Lank who, in 1938, gave the anesthesia for the first successful ligation of a patent ductus arteriosus. She also anesthetized the first patients operated upon at this hospital for coarctation of the aorta and for tetralogy of fallot. In addition to directing the Department, Miss Lank trained several groups of nurse anesthetists.

After 34 years of continued and excellent service, Miss Lank retired February 28, 1969.

In 1946 Doctor Robert M. Smith joined the staff as the first physician to devote full time to anesthesia, and began the organization of a physician staff which now numbers five individuals.

One of the principle changes the physician staff brought about was the establishment of an active training program for residents, which was started in 1946. In the intervening years this program has provided experience and training for more than 400 residents for periods varying from on to 18 months duration.

The five-man staff now provides ample clinical guidance in the practice of anesthetic techniques. In addition, one of the staff, Doctor Dean Crocker, has established an extremely effective Respiratory Therapy Service, upon which most areas of patient care now depend heavily.

Organization of Department

The Anesthesiology Department operates as an independent service within the hospital. The staff consists of five anesthesiologists who devote all of their time to work at this hospital, two nurse anesthetists, and a complement of nine resident anesthesiologists. The permanent staff members are:

Robert M. Smith, M.D.
John G. Adams, M.D.
Dean Crocker, M.D.
Carol H. Johnson, D.M.D.
Louis S. Robbins, M.D.
Bessie Lank, R.N.A.
Sylvia Anne Crooper, R.N.A.

There has recently been a marked increase in both the number and the quality of doctors seeking training in anesthesia. Although this has not been true throughout the country, many of the teaching hospitals in the Boston area have been able to choose from a large list of applicants, with the result that the general character of residents chosen has been unusually high.

During the past year, 29 residents received training in anesthesia at this hospital. Nine came for a year of advanced training after completion of their basic two-year residency, while 20 came for periods of three or four months as affiliates from other residency programs.

The following served in the Anesthesia Residency Program during 1968.

<i>Advanced (Third Year) Residents</i>	<i>Dates</i>
Ester Yuro, M.D.	7-1-67-12-31-68
Leonila Benedito, M.D.	7-1-67-0-30-68
Govind Grag, M.D.	7-1-67-6-30-69
Priscilla Alanguilan, M.D.	11-1-67-10-31-68
Carmelita Aquino, M.D.	7-1-68-6-30-69
Kyoungho Cynn, M.D.	7-1-68-6-30-69 (incomplete)
Norina Ebata, M.D.	7-1-68-6-30-69 (incomplete)
Inder Malhotra, M.D.	10-17-68-10-31-69
Hans Muller, M.D.	11-12-68-10-31-69

<i>Affiliating Residents</i>	<i>Dates</i>
Brian Carroll, M.D.	11-1-67-1-31-68
Alix Mathieu, M.D.	1-1-68-3-31-68
Richard Traul, M.D.	4-1-68-6-30-68
John Hairabet, M.D.	7-1-68-9-30-68
John Willens, M.D.	10-1-68-12-31-68
Helen Morley, M.D.	11-6-68-12-31-68
Joseph Garfield, M.D.	12-1-67-3-31-68
Michael Edwards, M.D.	1-1-68-4-30-68
Karen Shea, M.D.	9-1-68-12-31-68
Lydia Egay, M.D.	11-1-68-12-31-68
Vance Geldart, M.D.	5-1-68-6-10-68
Thomas Stammers, M.D.	7-1-68-8-31-68
Timothy Sullivan, M.D.	9-1-68-10-16-68
Arleta Bingham, M.D.	3-1-68-5-31-68
James Grim, M.D.	1-1-68-6-30-68
Joseline Brestle, M.D.	2-1-68-4-30-68
Elsie Johnson, M.D.	11-1-68-12-31-68

Responsibilities

I. Patient Care

The primary responsibility of this Department has always been to provide safe and suitable anesthesia for performance of surgical operations. While the greatest part of our work is confined to the eight Operating Rooms in the Main Operating Floor, there are several other locations where anesthesia may be required, including two rooms in Throat Operating Room, three in Surgical Emergency Clinic, three in Radiology, one in Tumor Therapy Clinic, and one in the Hyperbaric Chamber.

During 1968 a total of 9,137 anesthetics were administered by members of our staff in this hospital.

These were divided among various services as follows:

Medical	46
Tumor Therapy	634
Orthopedic	1,242
Neurosurgery	420
General Surgery	3,624
Cardiac	407
E.N.T.	1,617
Dental	352
Plastic	507
Eye	184
X ray	104

In addition to administration of anesthetics, anesthesia care includes preoperative evaluation of patients, supportive therapy during operation, and continued observation and support throughout recovery. Following operations, patients are attended in the Recovery Room where specialized nursing care is supervised by anesthesiologists who are responsible for final decision concerning the time of transfer of patients to original nursing divisions.

A significant role is played by the Anesthesia Department in resuscitation and ventilatory support of non-surgical patients throughout the hospital. In conjunction with the Respiratory Therapy Service, described elsewhere, anesthesiologists carry much of the responsibility for emergency care of patients suffering from status asthmaticus, Guillain Barré syndrome, and other critical respiratory problems. The anesthesiologists also serve as consultants in hyperbaric oxygen therapy and are responsible for ventilatory management of all patients undergoing this form of therapy.

A 24-hour service for blood gas determination is maintained by the Anesthesia Department, serving all departments of this hospital as well as the Lying-In Division of the Boston Hospital For Women. This has proved to be of great assistance in management of acutely ill patients of all kinds, and invaluable in patients who are being maintained in mechanical ventilators. While many of these patients have been children in the early post-operative period following cardiac surgery, many have been newborn infants suffering from respiratory distress syndrome, severe asthmatics, or patients with advanced cystic fibrosis.

In order to centralize and facilitate scheduling of patients for operation, a full-time secretary has been established in the Anesthesia Office, where she records all regularly scheduled operations and makes up the daily operating list. This activity has been organized and directed by Doctor John Adams and has proved distinctly advantageous. It also has made it evident that further economy of time might be achieved if scheduling procedures were

established on a more rationally regulated basis than has as yet been possible.

Teaching and Research

Clinical instruction is one of the foremost interests of this Department. The five members of the teaching staff are all oriented toward on-the-spot training, and with the wealth of material on hand the opportunity for learning technics of Pediatric Anesthesia can hardly be matched. Trainees are closely supervised and no general anesthetic is ever given at any time unless a member of the senior staff is in attendance.

In addition to clinical instruction, ample didactic teaching is also offered. Weekly meetings are conducted at this hospital devoted chiefly to Pediatric Anesthesia or related topics, while supplementary lectures and clinics, given by neighboring departments at Peter Bent Brigham, Beth Israel, and Massachusetts General Hospitals, plus symposia organized by the combined Harvard Medical School Anesthesia Department, provide more opportunity than can possibly be grasped.

Meetings of local and regional anesthesiological organizations are held at sufficiently frequent intervals to provide stimulation and interest for students and practitioners at all levels, and our residents are sent to these meetings, expenses paid by the Department.

Although the majority of our trainees are residents already committed to the specialty of anesthesia, some teaching is directed toward non-anesthesia residents and some toward ungraduate medical students and nurses. It has been our policy to attempt to instruct all residents and nurses in the hospital in the basic elements of cardio-respiratory resuscitation. During the past year, Doctor Adams has held numerous clinics instructing nurses in this important area. Although Harvard Medical School students have had very slight exposure to instruction in Pediatric Anesthesia, an attempt has been made to introduce all of them to the existence of this small activity and again to impress upon them the simple but invaluable mechanics of airway control in acute ventilatory emergencies, chiefly that of endotracheal intubation and resuscitation.

One particular opportunity to bring younger medical school students into contact with problems of anesthesia has been created by the Preceptorship Program of the American Society of Anesthesiologists. Under this program, several hundred first or second year medical school students are granted eight-week scholarships, usually in the summer, in an accredited Anesthesia Department in teach-

ing hospitals throughout the country. They are in close contact with patients, usually for the first time, and learn such fundamentals as resuscitation, endotracheal intubation, airway maintenance, plus many intangible aspects of human relationship. Thus far, three students have had such training in our Department and students and staff have been much pleased with the entire undertaking.

A considerable amount of time, energy, and expense of various members of our Department has been devoted to preparing papers and delivering lectures throughout the countryside. This year, Doctor Smith's "Anesthesia for Infants and Children" underwent a third edition, while Doctor Crocker is in the final throes of completing a much needed volume on Respiratory Therapy.

Investigational activity has not been a strong function of the Department, which until recently has limited itself almost entirely to observation of clinical phenomena. During the past year, however, under the 3.5 million dollar combined Harvard Medical School Anesthesia Grant awarded by the National Institute of Health, our Department has been able to launch a modest effort in laboratory investigation. This has been directed toward an attempt to trace the relationship of succinylcholine. The investigation, performed chiefly by Doctors Johnson and Garg has been performed on dogs. Although a large dog is much more profoundly paralyzed by small amounts of succinylcholine that is an infant, dogs have as yet not shown the sudden cardiac depression that could help to explain our problem. Fortunately, our grant has been extended for further exploration.

Additional Activities of the Anesthesia Staff

Doctor Smith completed his second term as President of the Medical Staff in 1968. This year proved to be an exciting one due to the announced adoption of new medical school-hospital relationships and the proposal of other sweeping changes. The impact of these changes upon different hospital departments would obviously differ considerably and methods of meeting various problems were studied by a Committee on full-time appointment headed by Doctor Smith.

In September, Doctor Smith was decorated by the Nicaraguan Government for two weeks emergency service in 1967.

Doctor Smith is presently Secretary of the Section on Anesthesiology of the American Medical Association and an Associate Editor of the *Survey of Anesthesiology*. As a delegate of the American Society of Anesthesiologists, he attended the World

Federation of Anesthesiologists in London, September 9-12, where he delivered a paper.

Report of Respiratory Therapy Service

During the past year the Harvard Teaching Hospital's School of Inhalation Therapy, in association with Northeastern University, came into being due to the combined efforts of Children's Hospital, the Massachusetts General, the Beth Israel, and the Peter Bent Brigham Hospitals. The educational program is designed as a three-year curriculum leading to an Associate in Science degree in Inhalation Therapy. Dr. Dean Crocker of Children's is Chairman of the Medical Advisory Committee for the school of the Harvard Teaching Hospitals.

Twenty-eight students are in training at the present time in the first year. Sixty-five students have been accepted for the year beginning September, 1969.

Children's Hospital Respiratory Therapy Department provided the following services during 1968:

Patients receiving oxygen	31,203 patient days
Patients utilizing oxygen tents	11,649 patient days
Patients requiring high humidity therapy	19,615 patient days
Patients requiring mechanical control of respiration	1,287
Patients requiring artificial temperature regulation	722
Infants requiring incubator therapy	2,682

The Respiratory Therapy Department is presently operating with nine respiratory therapists and four technicians, providing 24-hour-a-day coverage of all life support systems utilized at Children's Hospital. Aside from their hospital duties, all therapists are active in the New England Chapter of Inhalation Therapy, and two are delegates to the American Association of Inhalation Therapy.

The Department works with the In-Service Nursing Education Program providing formal classroom and clinical instruction. All Children's Hospital nursing students receive formal classroom instruction and rotate through the Department for clinical experience in their senior year.

At the present time, the scope of the Department is to furnish assistance with emergency resuscitation and to give intensive prolonged ventilatory therapy and guidance of routine oxygen therapy; also to give intensive bedside respiratory care, assessing ventilatory status, and accurately recording observations and therapy in the patient's record; to perform necessary manipulative and therapeutic measures as prescribed by the physician including

assisted ventilation by hand or machine, hyperventilation technics, tracheal instillations, specialized turning and positioning for drainage of secretions, expiratory assistance, aseptic endotracheal suctioning, and controlled ventilation technics using available respirators; to use all respiratory equipment with skill including respirators, flowmeters, positive pressure devices, resuscitators, laryngoscopes, endotracheal tubes and other oxygen administering

devices; to utilize temperature control devices, monitors, and sigmamotor pumps under varying conditions of environment.

With the ever increasing technological advancement in the use of life-support systems, the Department looks forward to greater utilization and development of mechanical devices for maintenance of vital physiological parameters in children during periods of stress.

DEPARTMENT OF DENTISTRY

Paul K. Losch, D.D.S.

At this time of our Centennial it is interesting to note that last year the Harvard School of Dental Medicine celebrated its Centennial as one of two of the oldest Dental Schools in the United States. As near as can be determined from the records, the first official dental appointment to the Hospital Staff was in 1912 when a teacher from the Dental School (later to become Dean) was appointed to the Surgical Staff as Consultant in Diseases of the Digestive Tract. Since that time there has always been an appointee under one title or another of a teacher from the Dental School on the staff of the Hospital.

There seemed to be some doubt whether these appointments were under the medical or surgical service of the Hospital until 1923 when it became clear that all reporting was done through the surgical service. It was not until 1950 that an autonomous unit under the title Department of Stomatology with its Chief of Service was established and held responsible for all dental services. Since there was frequently some question as to which stoma the Department devoted its attention, the title was changed a few years later to Department of Pediatric Dentistry and in recent years has been known as The Department of Dentistry.

The preceding notes are significant since they also indicate the growth and interest of the Department in patient services, teaching and research. From 1912 to 1916, no one year reported more than 22 treated cases which were mostly extractions of "carious" teeth and treatment of an occasional "stomatitis."

In 1916 the first note on attention to "Harelip" and "Cleft Palate" appeared in the record. These notes continued and by 1923 the service demand for these patients had grown to 27 new cases. It therefore became necessary to add 3 one-half day a week visitors to the surgical staff who devoted their time entirely to the orthodontic and prosthodontic care of cleft palate patients.

By 1929 such additional diagnoses as "osteomyelitis of the mandible", "malocclusion", "palatal cyst", "alveolar abscess", "gingivitis", "stomatitis", "Vincent's angina" etc., became constant in the reports and it seems apparent that awareness of oral problems on the part of the general hospital staff and administration had established the need for constant services of a dental staff.

An oral pathologist had been appointed to the staff by 1933, and the first steps were taken in clinical investigation and research in the problems of the teeth and oral cavity. This interest has continued to grow until now we have one full-time member of the staff who devotes all his time to research

in oral biology and the guidance of post-doctoral students who come to spend one to three years with us. A splendid new laboratory in the building now under construction for research in pediatric problems will be entirely devoted to research in problems of the oral cavity.

First Intern Appointed

In 1934 the first intern in dentistry was appointed and from this beginning has grown a postdoctoral teaching program which now involves an annual incumbency of two Residents, two Interns, three Hospital Fellows and three Harvard Fellows whose terms of attendance range from one to three years. In addition to these learners we also conduct a predoctoral program with the 3rd and 4th year students from Harvard School of Dental Medicine which we are now planning to expand to a six-week tour of clinical treatment and an additional tour of two or more weeks as clerks on the wards where they can expand their understanding of physical diagnosis in pediatric patients.

Frequent visitors who come for periods of one day to two or three weeks from other groups such as public health, social sciences, foreign schools, the military forces, nursing, etc., are welcomed and are encouraging to us since they indicate the growing interest in the oral health of children — a field which we can truly say has been pioneered by this hospital.

As an integral part of the hospital, the Department has been able to participate in many activities of other departments. Due to our understanding of technical and mechanical skills, we have created special instruments and appliances for the Departments of Surgery, Orthopedics, Hematology, Neurosurgery and various special laboratories. This work continues as one of our most interesting endeavors especially in special prostheses for other parts of the face such as external ears, eyes, noses, etc.

Continuous microscopic study of disassociated teeth from our patients has not only added to our knowledge of the growth and development of these structures but has also been rewarding in the understanding of such problems as the exact chronological occurrence of hemolysis in Rh incompatibility, the effect on the fetus of exanthematous diseases during pregnancy and the distribution by vital staining from biliary diseases and chemical intoxication such as in overingestion of fluoride-bearing compounds.

Currently, laboratory studies not always directly related to the teeth are an exciting part of our interest in such areas as genetics, organic and inorganic

composition of oral fluids, physiology of taste, psycho-behavior of patients under stress, control of hemorrhage from dental interference in hemophilia, structural behavior by the supporting tissues of the teeth in the presence of chronic systemic disease, organic disease, etc.

Though orthodontia has always been a major interest of the Department, particularly in cleft palate, a recent acceleration of studies in the correction of facial deformities by combined surgery and orthodontics proves to be most exciting. In almost dramatic surgery whole sections of the face or jaws are disarticulated or resected — and with the aid of bone grafts, muscle reattachments and application of regulatory appliances the entire appearance of faces are altered. These services will hopefully be tremendously expanded to meet the real clinical need now existing. Within the next year, another young man will join our staff whose extensive training in oral surgery is now being augmented with training in general surgery and whom we believe will bring a new dimension to these studies.

4,300 Orthodontic Visits

Of course the many less dramatic demands for orthodontic services continues not only for esthetic assistance to patients but for important correction to aid growth and development of the teeth and face as well as assistance in speech, mastication, etc. Evidence of this demand is illuminated when we report that there were more than 4,300 visits made to our clinic last year for orthodontic care alone.

We are happy to report that the special clinic created four years ago for studies in time and motion as well as improvement in materials and instrumentation in routine dental care of patients is continuing. Though not as dramatic as the 35 per cent improvement in services against time reported in our first year, there is a steady increase in operating efficiency. Patient and parent education as a result of these studies is steadily improving with less involvement of expensive professional personnel.

Also, as a result of these studies we now hope to establish another special clinic as a pilot study in the use of paramedical aides which will be more extensively involved than is now permitted us by the employment of dental assistants and hygienists. We have submitted an application for government funds great enough to establish a six-unit expansion of our clinic with this in mind.

At the beginning of this report, I noted from the past records that three cases were treated by one dentist in 1912. It seems some advancement has been made over the past 57 years when one reviews the following. Last year, 154 patients were admitted to the hospital by this service and approximately 75 more were given dental care who were hospitalized by other services. Most of these patients received complete dental care under general anesthesia. In addition, the 35 people now comprising Senior Staff, House Staff, Fellows and assisting personnel served patients for more than 14,500 out-patient visits in this last fiscal year. A significant number percentage wise of the total out-patient visits made to the entire hospital.

A final note seems permissible to the writer even though it may not be appropriate. As I look back over the 37 years of my association with this great institution (more than one-third of its existence), I have an overwhelming feeling of gratitude to the Staff and Administration for their tolerance and encouragement. I particularly appreciate the opportunity we have had to assist 48 fine young men and women to achieve part of their postdoctoral education in an institution so richly endowed with those elements necessary to an inspiring learning environment. Many of these people have distinguished themselves in this country and abroad to the credit of the hospital.

Coincidentally, this Centennial year also marks the last year of my service and I leave content that the next 100 years will be even more exciting for those fortunate enough to participate in the activities of this fine Medical Center.

DIVISION OF LABORATORIES AND RESEARCH

Sidney Farber, M.D.

The celebration of the Centennial of the founding of the Children's Hospital inspires the temptation to record the history of the Department of Pathology and its extension, which became the Division of Laboratories and Research in 1946. This will be printed separately in 1970 to mark the end of one long chapter in the history of the hospital. This report, therefore, covers the activities of the preceding two years. This Division was an outgrowth of the Department of Pathology, on July 1, 1946 by action of the Board of Trustees as a first step in the expansion of The Children's Hospital into The Children's Hospital Medical Center. The move was in response to long term planning designed to find solutions for unmet needs for the development of the Department of Pathology and for the delivery to the clinical services of clinical laboratory information in a more effective way than had been possible before. The original conception accepted by the Trustees also included the creation of laboratories of basic research, utilizing the techniques of biology, chemistry and physics applied to the several disciplines of immunology, experimental pathology, pharmacology, physiology, and biophysics for the solution of problems concerned with the normal and the sick infant, child and adolescent.

The Division of Laboratories and Research established in 1947 two of the recommended pre-clinical research programs. The first, the Laboratories of Infectious Disease Research, under Dr. John Enders, still thrives under his leadership; the second, a short-lived laboratory of Biochemical Research, failed to survive because of lack of space and resources. At that time the widely scattered and poorly organized clinical laboratory services were brought together under one director, Dr. Shwachman, whose activities will be described under the heading of Clinical Laboratories.

The philosophy underlying the creation of this Division is now being employed to the advantage of the development of The Children's Hospital Medical Center as a whole in such new endeavors as the Clinical Research Center and in the plans presently being formulated for the development of research and care on a greatly expanded scale in the field of mental retardation, and in research programs of the several departments of The Children's Hospital Medical Center. The realization of such a conception of research and routine within a hospital setting is found in an affiliated but independent institution, the Children's Cancer Research Foundation, which had its beginning in the Department of Pathology and in some of the unfulfilled plans of the Division of Laboratories and Research. In this

Foundation, authorities in the sciences basic to medicine and in this case cancer, work individually, in groups or in teams, often in collaboration with medical doctors, toward the twin goals of discovery of new means of treatment and hopefully of cure for diseases for which satisfactory treatment is not available, and toward the generation of new knowledge designed for the prevention or eradication of incurable cancer.

The original plans for the expansion of the Division of Laboratories and Research into an Institute of Pediatric Research at the Children's Hospital were postponed repeatedly because the time was not yet ripe in the history of the hospital for such a bold but absolutely essential development. Happily the new research building, now under construction, will make possible the implementation of the general plan of 1946, now altered to include the great developments in science and pediatric research since that time.

Department of Pathology

Service by pathologists to the Children's Hospital began in 1876, seven years after its founding. Dr. E. V. Cutler served as a Visiting Pathologist. In 1915 Dr. S. Burt Wolbach, then Associate Professor of Pathology, and in 1923 Shattuck Professor at Harvard Medical School, began a part-time relationship with the Children's Hospital which did not end until his death in 1954. Throughout these years he served as a volunteer. In his Annual Report for 1929 Dr. Wolbach stated that he had volunteered without compensation or assistance other than one poorly paid technician, to manage the Department of Pathology, sustained by a high degree of enthusiasm based on the opportunities for service and advancement of knowledge afforded by the challenge of the problems encountered here. On several occasions he expressed his opinion "that no field of medicine offers greater possibilities for advances in prevention and treatment of disease than that covered by the combined Infants' and Children's (Pathology) services. The records of the Pathology Department at the present time, and the collections of material carefully preserved represent a treasure house of potential knowledge". He added an additional note understandable today that "enthusiasm, however, can only be maintained by occasional realizations, and realization is impossible while in a state of constant struggle to achieve the minimum satisfactory routine," because of lack of resources. He emphasized that no sharp line can be placed between properly conducted routine and research, and he advised the Trustees that no sharp line be

drawn in assigning hospital expenditures between care of patients and research and teaching.

Dr. Wolbach's main energies, particularly from 1923 to his retirement at the end of 1947, were devoted to the duties of the Chairman of the Department of Pathology at Harvard Medical School and to the responsibilities of the Pathologist-in-Chief at the Peter Bent Brigham Hospital. His official visits to the Children's Hospital were limited to once a week period of consultation, but he was available always for help in time of emergency. Dr. Wolbach was recognized as one of the great men in the history of American Pathology. His supremacy was in the field of infectious disease. For the first half of his professional career, his greatest contributions concerned the causation and transmission of typhus fever and Rocky Mountain spotted fever. The second part of his professional life was spent in defining the specific lesion produced by each one of the most important vitamin deficiency states. His writings constitute masterpieces of experimental work and superb description. His greatness as a teacher is remembered by pupils who left to assume important professional positions in many parts of the world. His role at the Children's Hospital was that of a senior statesman and his advice was eagerly sought by the staff.

In the summer of 1927 when he invited the writer to come to the Children's Hospital Department of Pathology, he enunciated the challenge in words that stated clearly his conviction that he saw more problems to be solved in one week at the Children's Hospital than in one year in a hospital for adults. On his retirement from Harvard Medical School he came full time to the Children's Hospital in a post created especially for him — Chief of the Division of Nutritional Pathology. Here he continued his fundamental contributions to hypervitaminosis states and consulted with any one who chose to seek his advice. His last three years were spent in quarters especially designed for him in the Jimmy Fund Building of the Children's Cancer Research Foundation. His name will be associated with the Children's Hospital throughout time, through the S. Burt Wolbach Professorship of Pathology at Harvard Medical School and at The Children's Hospital Medical Center. His devotion to the Children's Hospital will be remembered as long as those who had the privilege of knowing him as pupil, or colleague, or friend survive. He would have been proud indeed to know that his son, William W. Wolbach, presided as President during the period of realization of the greatest dreams and plans in the century of life of the Children's Hospital.

The routine responsibilities of the Department of Pathology have continued under the immediate direction of Dr. Gordon Vawter. With the devoted and expert assistance of his colleague Dr. Hubert Jockin and the aid of the resident staff the greatly increased routine has been carried out on a large scale. Dr. Vawter's scholarship and his unselfish willingness to be of assistance to any member of the staff on problems concerning patients, or on pathologic aspects of research, carried out on any service, have been recognized as a unique contribution. The pathologist, the radiologist, and the clinical laboratory chief come in contact with all members of the hospital family. These men in the Children's Hospital are invaluable. Indeed without them the clinical services could not carry on. Dr. Vawter has made an enviable reputation for himself as a pathologist, a teacher, and as a scientist with special interest in immunology of early life. Both Dr. Vawter and Dr. Jockin have worked ceaselessly and unselfishly to meet the needs of the clinicians and to maintain the high standard of excellence of the records of post-mortem examinations. These represent a storehouse of information for the student, the resident, or the staff member interested in detailed information concerning the biology of disease and clinical pathologist correlations.

Thirty-eight years ago, the Department of Pathology moved into its present quarters. The far-sighted planning of 1931 has been continuously apparent in its provision for the highest quality of service to patients and staff. Ready accessibility has fostered a record of highly effective collaboration with the clinical staff; proximity to the clinical laboratories stemmed from the prevalence in infectious disease and has facilitated joint investigation of metabolic and biochemical abnormalities; model post-mortem procedure and autopsy facilities have been the focal points successively for the eras of pioneering discovery, of documentation and instruction, and more recently for development of the subspecialties of pediatric pathology. Quarters that once housed the Pathologist, a handful of internes and residents, and a small technical and secretarial staff, are now occupied by: the Pathologist, the Associate Pathologist, the Neuropathologist, the Cardiac Pathologist; residents, post-doctoral trainees, and research fellows in each field; and separate technical staffs not only for each field but for special diagnostic areas — histochemistry, enzyme chemistry, embryology. What was once research space has now been devoured by the ever-increasing demands for service to patients and staff. There are now six times the number of surgical acquisitions, twice

the number of post-mortem examinations and x times the number of inquiring clinical colleagues. The Assistant Neuropathologist has an office in the Children's Cancer Research Foundation; the Orthopedic Pathologist and Ophthalmic Pathologist, available for consultation, are housed elsewhere in The Children's Hospital Medical Center.

Research in the Department

Research in the Department of Pathology gave rise 21 years ago to the affiliated institution, the Children's Cancer Research Foundation, whose goal-directed activities of total care for children and adults with cancer and of cancer research have, from the beginning, been more searchingly based on programs of molecular and cell biology, of transplantation and immunogenetics, of environmental carcinogenesis, and of therapeutic synthesis and testing. In the 21 years since the Children's Cancer Research Foundation was organized as an independent institution, its staff has published more than 1600 papers in the leading medical and scientific journals of the world. These are not recorded in this Report.

The Department of Pathology provided the initial research staff of the Children's Cancer Research Foundation, and has met most of its own challenges for research space and opportunity by outgrowths from this birthright. However, the time has come when clinical care and research in pediatric fields other than cancer demand multidisciplinary facilities and personnel. Once again, the Department of Pathology is providing key personnel and a long experience in the study of disease as cornerstones for new programs of enormous magnitude in Cardiology and in Neurosciences and Mental Retardation. Research in the Department is now being effectively carried out additionally by collaboration in several other departments of the hospital, and in neighboring institutions. Joint appointments continue to be useful devices for strengthening this department's program and for sharing its strength. It is apparent that the growth of service-connected responsibilities and diagnostic facilities have claimed departmental resources and personnel while research efforts have more and more sought expression elsewhere.

During the two years since the last Annual Report Summary, 602 autopsies were performed, 7952 surgical specimens examined and 574 consultation requests accommodated. The Neuropathology Unit, under Dr. Floyd Gilles has added a Muscle Biopsy Service to its regular examination of post-mortem and neurosurgical nervous system specimens from

The Children's Hospital Medical Center and selected specimens at the Peter Bent Brigham Hospital. The Cardiac Pathology Unit, under Dr. Rich and Van Praagh continues its detailed examination and reports of congenital abnormalities and other diseases of the cardio-vascular system. The Pathology Department and Neuropathology Unit have conducted regular weekly conferences attended by members of their separate or combined house staffs and trainees, as well as by interested members of various clinical departments. The Cardiac Pathologist participates directly in the conferences of the Cardiology Division and like his colleagues in Neuropathology and Pathology has contributed to the laboratory instruction of second year Harvard Medical students. Members of the three groups have lectured by invitation at hospitals and research institutes in the United States, Central and South America, and Canada. Papers have been presented at annual meetings of representative societies of pathology, neuropathology and cardiology while total publications from the three groups number 36, including six abstracts and seven papers in press.

Of particular significance for clinical effectiveness are those papers that represent interdepartmental collaborative assessment of therapeutic regimens or disease spectra. One-half of the published papers stem from such cooperative endeavors between members of the Pathology Department, and of the Departments of Medicine, Radiology, Cardiology, Neurosurgery, Neurology, Tumor Therapy, or Orthopedics at The Children's Hospital Medical Center and the Children's Cancer Research Foundation. Dr. Vawter has continued to explore by histochemical demonstration the evidence for varying enzymatic spectra in experimental animals and in tissue disease. Together with Dr. Uzman, Senior Associate in Pathology, they have surveyed selected diseases with correlated ultrastructural and histochemical techniques. Dr. Gilles has widened his scope of responsibility and opportunity by undertaking the neuropathology examinations at the adjoining adult hospital (Peter Bent Brigham Hospital). However, his research interests in perinatal injury to white matter have proceeded at an increasing pace with the help of Dr. Sean Murphy, special fellow in neuropathology. His Assistant Neuropathologist, Dr. Tessa Hedley-Whyte, is completing three years of research fellowship in the Program of Biological Ultrastructure and Experimental Pathology at the Children's Cancer Research Foundation, under Dr. Betty G. Uzman. Her research interests in the localization of long

term molecular components of myelin and nerves bear directly on understanding the importance and adequacy of nutrition during myelination, which in the human covers not only a pre-natal period but extends into late infancy and early childhood. Dr. Hedley-Whyte will be quartered in the new research building scheduled for completion in the fall of 1970; she will be responsible for the ultrastructural research in the mental retardation program and will continue to assist Dr. Gilles in the service neuropathology at The Children's Hospital Medical Center and the Peter Bent Brigham Hospital. Dr. Van Praagh, Cardiac Pathologist, has been in constant demand as a lecturer and uncannily coherent interpreter of congenital heart development anomalies to medical students and pediatric cardiologists and heart surgeons in the United States, Mexico and Canada. He is responsible for authoritative chapters on this subject in a number of textbooks in the field. He works in close connection with the Cardiology Group under Dr. Nadas, and with Dr. Manesek, investigator in the Cardiology Department of cardiac development at the ultrastructural level.

The contribution of Dr. Betty Geren Uzman to the Department of Pathology has been enormous. Her full support comes from the Children's Cancer Research Foundation where she is Chief of the Programs of Tissue Ultrastructure and Experimental Pathology. She has unselfishly shared her knowledge and facilities in the training of carefully selected experimental pathologists, some of whom are being prepared for independent positions in the hospital. Her contributions are excellent examples of generous cooperation with affiliated institutions which we hope will continue through the years.

It is pleasant to record that Dr. J. LeRoy Conel, now well past 80, continues his monumental studies which he began in 1931 in the Department of Pathology. He is now completing the ninth volume on the cytoarchitectonik of the brain at various age levels. In this volume the cortex of the child at the age of eight years is described. His painstaking work is unique. His studies form the basis of judgments concerning the degree of development of a brain at each one of the age periods he has completed. His accomplishments should be as valuable 100 years from now as it is today. The Department of Pathology is proud that it has helped to make possible this extraordinary piece of work, which for the last 20 years has been supported by the National Institutes of Health in the program of the National Institute of Neurology and Stroke.

Research Division of Infectious Diseases

John F. Enders, Ph.D., Chief

As during the past several years, the efforts of the laboratory have been in three main directions. First, the study of various aspects of viral oncogenicity employing as models Simian virus 40 and the adenoviruses; second, the study of the replication and cytopathogenicity of non-oncogenic viruses in a variety of cell systems with particular emphasis to factors involved in natural cellular resistance; and third, the study of viral infections in patients both in the Children's Hospital and elsewhere.

In addition to purely investigative work most members of the laboratory have engaged in teaching medical students, internes and residents and postgraduate students. Dr. Katz and Dr. Wilfert have played a major role in organizing and implementing the current Training Program in Infectious Diseases instituted jointly by the Children's Hospital and the Beth Israel Hospital.

During this period the Division moved from quarters it so long occupied in the Children's Cancer Research Foundation and in the Carnegie Building to a newly constructed interim laboratory. Another important event in the affairs of the Division was Dr. Katz's departure in the early summer of 1968 to become Professor and Head of the Department of Pediatrics at Duke University. In addition, Dr. John F. Enders was elected a Foreign Member of The Royal Society of London in 1967, and was awarded the honorary degree of Doctor of Science, by the University of Ibadan, Nigeria, in 1968.

The following is a summary of experimental work done mainly during the period July 1, 1966 to July 1, 1967:

I. Experiments on Viral Infectivity and Cytopathogenicity

The Cell Fusion Technique and its Application to the Growth of Viruses in Resistant Cell Systems. We have recently shown that when cells from species of high resistance to infection with poliovirus are exposed to this agent and cell fusion subsequently induced by the addition of concentrated inactivated Sendai virus, multiplication of poliovirus subsequently occurs to levels approximating those retained in susceptible human or monkey cells systems. These experiments were undertaken on the hypothesis that the barrier to infection lay at the cell surface and that if means could be found to place the infective virus particle within the cell, replication would follow, since Holland had demonstrated in 1958 that poliovirus nucleic acid induced the replication of complete virus in resistant cells.

The basic motivation for this work was the idea that failure to cultivate certain agents like the viruses of hepatitis and infectious mononucleosis might depend upon the choice of cells that present a surface barrier to penetration of the intact virion. Poliovirus was chosen as a model to determine whether cell fusion might be a means of overcoming this barrier.

Subsequent work to improve and simplify the technique has shown that consistently high titers of poliovirus I (105.0-106.5 ID/0.1 ml culture fluid) can be achieved using a line of hamster embryo cells as the medium. It has furthermore been demonstrated that instead of the suspended cell preparations first employed, conventional monolayer cultures give comparable or even better results. In the monolayer system it has also been possible to observe regularly typical poliovirus cytopathic changes in polynucleate cells formed as a result of the fusion. Various parameters of the method have now been defined and experiments are in progress to determine whether any indication of viral multiplication can be obtained in fused culture systems exposed to materials considered to contain the agents of infectious and serum hepatitis. The importance of exploring any procedure that might prove effective for this purpose is, we believe, obvious.

While the fusion technique with poliovirus has been found successful, clear-cut evidence has not yet been obtained that the original hypothesis is correct which envisioned the purely physical incorporation of poliovirus particles lying by chance in proximity to cells undergoing fusion. Since the manner in which this virus is incorporated still remains uncertain, experiments are underway to define, if possible, the mechanisms. This effort seems desirable, since further knowledge of interactions between particles of different viral species as well as the effects of the fusion factor on the cellular membrane may be obtained.

Experiments with Rubella Virus. About three years ago it was shown in this laboratory that rubella virus is capable of multiplying in primary hamster kidney cell cultures with associated cytopathic changes. It was then decided to determine whether, after an indefinite number of passages in this cell system, the virus might be adapted to growth in chick embryo cell systems. Such a procedure is comparable to that which proved successful in the case of measles virus in this laboratory, which provided the basis for the attenuated vaccine now generally employed. The basic objective was to propagate the virus of rubella for possible use as

a vaccine in a system with which wide experience in the production of attenuated vaccines has now been gained. Rubella has been passed 58 times in primary hamster kidney cell cultures. A moderate increase in viral titer and an earlier onset of cytopathic change have been noted in the later passages. Tests at intervals to determine whether capacity to infect chick embryo cells might have developed have so far been negative. Although rubella vaccines developed by others employing different cell systems are now under trial, it would seem worthwhile to continue, at least for a time, as we plan to do, this effort to adapt the virus to chick cells for the reason mentioned above.

In future, attempts to this end, we shall also explore the fusion method as a means of initiating rubella virus replication in chick cell systems. Preliminary experiments of this sort have been done without success, but their failure may be due to the relatively small virus inoculum employed.

It has lately been observed that when normal chick embryo cells are grown in proximity to rubella virus-infected hamster cells, rounding and degeneration of many chick cells occurs after 3-5 days. Although sought, no evidence of rubella virus replication in the chick cells has been obtained. The chick cell destruction is not caused by exposure to fluids from such cultures, by cell extracts of infected hamster cells, or by association with normal uninfected hamster cells. Although the significance of this phenomenon is at present unclear, attempts to elucidate its mechanism seem desirable and will be made, since one may speculate that this infected cell-associated toxic factor might be involved in some of the pathologic changes induced by rubella virus.

Continuing Serological Study of Children Who Received Rubella Vaccine. Ten serologically susceptible institutionalized children have been recently vaccinated with Meyer and Parkman's rubella vaccine (HPV-77). HI antibody responses occurred in all so far examined. Five comparable children in contact with the vaccine recipients have been retained as controls. Serological examinations will be made periodically over a protracted period to determine the duration of resistance and the results of natural exposure to rubella if this occurs.

Experiments *in vitro* on the Reactions of Human Blood Leucocytes *in vitro* to Vaccinia and Other Viruses. Experiments were initiated during 1966 to determine whether human blood leucocytes from previously infected and non-infected subjects cultivated *in vitro* will react in different ways on exposure to vaccinia virus. It was planned to study

comparatively viral replication as well as the effect of the virus on mitosis. These experiments were undertaken with the purpose of obtaining data which might point to a means of identifying new viruses which may affect human leucocytes as well as providing further information on the role of these cells in antiviral defenses. Effort has so far been largely devoted to working out procedures for obtaining standard W.B.C. cultures and assaying the proportion of W.B.C. that becomes associated with virus after exposure. Evidence of viral replication within W.B.C. has been obtained and some quantitative estimation of its extent determined. Preliminary results also indicate that mitosis of W.B.C. taken from a vaccinated person is depressed. This work will be continued.

II. Studies Concerned with Oncogenic Virus

Since about 1960 when studies of the effect of SV40 on human cells *in vitro* were initiated in this laboratory, our interest in the oncogenic properties of this agent has continued. The discovery of Huebner and his coworkers of the "Tumor" or T antigen in SV40-transformed cells and the more recent recognition by Rapp and his associates of the surface or "S" antigen in such cells have greatly facilitated researches on various aspects of the phenomenon of SV40 cell transformation with which we have been lately concerned. Experimental work in this area has been carried out principally by Dr. George Th. Diamandopoulos who will in the near future move his laboratory to the Department of Pathology at the Harvard Medical School. It is expected, however, that collaboration between Dr. Diamandopoulos who has lately received a grant from The National Cancer Institute, and the Responsible Investigator will continue in certain phases of the work which are summarized below. Dr. Peter Tegtmeier, a pathologist who is also interested in oncogenic viruses who came to this laboratory in July, 1967, is also involved in the continuation of these studies.

Studies on the Correlation of the Presence of the Viral Genome with Development of Oncogenicity. Recent investigations on SV40 in this laboratory have centered on the question of whether the intracellular viral genome is directly responsible for oncogenic transformation. This problem first became of major interest to us when it was observed several years ago that a clonal line of SV40-transformed kidney cells increased markedly in oncogenic capacity as passage *in vitro* of the cells was extended. This observation, like analogous findings of Dulbecco with polyoma virus-transformed cells, suggests that SV40, while in some way promoting

oncogenic transformation, may not act as its immediate determinant. Our interest in this problem was increased when, during the course of a series of experiments to discover whether cells from a variety of organs of the hamster where equally transformable by SV40, it was found that certain lines of cells originating from lung and liver tissues, although they eventually became morphologically altered and induced tumors in the hamster, failed to produce T antigen. At the time, the only effect attributable directly to the virus on these cells consisted in their capacity to persist as established lines in comparison with non-exposed controls. Thus the role of the virus in the induction of oncogenicity in these instances seemed very questionable. Recently, in collaboration with Dr. Fred Rapp of the Department of Virology at Baylor University, S antigen was demonstrated in several of these lines, but not in all. This indicated that the viral genome had become associated with some of these cell lines, but possibly in an altered, more submerged state, and so may have been involved in their oncogenic transformation. But this concept could not be firmly supported because "spontaneous" oncogenic transformation in other comparable lines in which no S antigen was detectable occurred at about the same time. These observations on lung and liver cells were confirmed and extended in a series of experiments in which unexposed control lines of non-oncogenic normal hamster embryonic cells were maintained under the same conditions with sister cultures exposed to SV40 during a period of 3 months, and then examined for the presence of S and T antigens and tested for oncogenicity. Tumor cells that arose as the result of the latter tests were also examined by the indirect fluorescence antibody method for the presence of S and T antigens. The results are summarized in Table I. It is evident that S antigen production occurred in two SV40-exposed lines along with the acquisition of oncogenic potential but without production of T antigen. Again, however, it was impossible to conclude that in these cells the presence of the viral genome, as indicated by the S antigen, was responsible for oncogenic transformation, since the homologous unexposed control lines became oncogenic during the same interval. Further work will be required to settle this point. It is noteworthy that two other lines reproduced both S and T antigens after exposure to SV40 and also became oncogenic, while the corresponding homologous control lines remained non-oncogenic. This finding supports many previous results obtained by ourselves and others in which the presence of T antigen appears

to be consistently associated with oncogenicity, although quantitatively the capacity of cells producing T antigen may vary widely in this respect as will be pointed out immediately.

The foregoing results appear to be of significance and worthy of further investigation for the following reasons:

- a. They emphasize the importance of including comparable non-oncogenic control lines in experiments directed toward the definition of the role of the virus in oncogenic transformation.

- b. They provide strong evidence that the viral genome may be present in at least two different states of activity. Final proof of this would be provided by induction of complete virus replication in cells producing only S antigen. Such experiments are planned.

- c. They suggest that positive tests for T antigen only as evidence for virus in naturally occurring tumors of man or animals might be misleading.

- d. They indicate the need for further investigation to determine whether S antigen production without T is consistently associated with the acquisition of oncogenic potential.

- e. They provide material for investigating whether implantation resistance depends upon S antigen.

Experiments on Changes on Oncogenicity of SV40-Transformed Hamster Cells. Because of the early observation mentioned above on increase upon *in vitro* passage in oncogenicity of a cloned line of hamster kidney cells, a systematic study of an SV40-transformed line of heart cells was undertaken. All or nearly all the cells in this line consistently produced T antigen. At four different levels ranging between the 18th and 112th passages, the cells of this line as well as several clones derived from it at each of these four passage levels were titrated by subcutaneous implantation in hamsters to determine oncogenic potential. The results so far indicate that progression of oncogenicity was found among the clones at all of the passage levels. For example, while one clone induced tumors in only one animal of six which received 106 cells, the most oncogenic clones induced tumors in doses of 10-100 cells. These results clearly show that although all cells tested exhibited oncogenicity, quantitatively this property may vary widely and independently of the presence of the viral genome as indicated by the presence of T antigen. The desirability of further comparative studies of clones of different oncogenic potential from biological as well as biochemical

points of view would seem to be desirable. As a beginning it is planned to determine whether the survival rate of cells from such clones that reach various sites after intravenous inoculation is significantly different. Later we hope to be able to carry out comparative studies of surface properties of these cells, possibly using electrophoresis and other recognized procedures.

We have also found that a marked increase in the oncogenic potential of the cells of clones of low oncogenicity may occur after multiplication *in vivo*. For example, cells derived from a tumor induced by the cloned line of lowest oncogenicity were found to induce tumors consistently when as few as 100-1000 cells were implanted. It has been determined that even after repeated passages *in vitro* of the tumor cells arising from this clone, the cells remain at the same high oncogenic level. This finding suggests that the observed increase in oncogenicity upon animal passage is not phenotypic but genetically determined. If so, it would seem likely that this mutation takes place independently of the viral genome. As a beginning in the biological analysis of the cellular factors responsible for increase in oncogenicity under these conditions in clonal lines, studies on the fate of the cells before and after animal passage when injected intravenously will be undertaken. Studies will be made later if possible on the nature and properties of the surface of appropriate clonal cells before and after animal passage, with the hope of revealing significant differences.

Experiments on Resistance to Viral Infectivity by Adenovirus-Transformed Cells. Syrian hamster cells originating from tumors induced by infection of Adenovirus 12 have been propagated *in vitro* in serial passages for more than one year. Morphology and nutritional requirements of the cultured cells have been studied and optimal environmental conditions defined for the several lines under investigation. The indirect fluorescent antibody techniques has been utilized to show that "tumor", but not "viral" antigen is produced by the cells of these lines during their entire experience in culture (25 tissue culture passages). Efforts to induce the release of infectious virus or viral DNA have not been successful to date. Presently these efforts are continuing in experiments employing the cell-fusion technique with these cells alone or in combination with human embryonic kidney cells.

The resistance of these cells has been tested against homologous (Adenovirus 12) and heterologous types of Adenovirus employing viral replication and cytopathic effects as criteria of suscepti-

bility. Four types of response have emerged as follows:

Criteria	Types of Response			
	A	B	C	D
Virus replication	+	+	0	0
Cytopathic change	+	0	+	0

Adenoviruses inducing each of the four responses will be further studied in order to determine whether its oncogenic potential in hamsters can be correlated with its characteristic effect *in vitro* on Adenovirus 12 tumor cells. If such correlation were established, an additional criterion for the recognition of specific Adenovirus genomes in naturally occurring tumors might be available.

Experiments on the Effect of Prolonged Cultivation *in vitro* on the Oncogenic Potential of Hamster Tumor Cells. It is proposed to determine the oncogenicity of 12 transformed cells derived from different levels *in vitro* by inoculation of hamsters to determine whether progression or decline in this property may occur.

III. Clinico-virological Studies

1. Attempts to isolate virus from approximately 230 patients in the CHMC during the period June 1965–January 1967 have been made. Thirty-eight agents were recovered. Two observations were made during the course of this work that deserve mention here: (a) Mumps virus was isolated directly in cultures of primary human kidney cells from the mouth and/or urine of three patients. Cytopathic effects consisting of multinucleate giant cells were easily recognized. It would seem that this culture system may provide a reliable and rapid means of laboratory diagnosis for mumps infection.

(b) Three as yet unidentified myxovirus-like agents were isolated from two cases with encephalitis and one with hepatosplenomegaly. These viruses produce multinucleate giant cells in human and hamster cell systems, but fail to multiply in chick embryos. They cause hemagglutination of guinea pig cells. Sera against representative known myxoviruses fail to inhibit agglutination or neutralize the virus. Further studies may establish these agents as a new species of the myxovirus group.

2. Using the technique of Meyer et al. (Division of Biologics Standards, NIH), the rubella hemagglutination test has been successfully employed to study antibody patterns in infants with intrauterine rubella infection. Results have paralleled the virus neutralization tests, thus permitting much more rapid diagnosis of rubella susceptibility of immu-

nity when indicated. This test can be readily applied in pregnancy and in cases of suspected rubella syndrome in infancy.

3. An extensive outbreak of lower respiratory tract infection in the Greater Boston area has provided clinical case material from 30 infants less than 3 months of age, who required hospitalization. To date, 14 strains of Respiratory Syncytial virus, 6 strains of Adenovirus, and a single ECHO virus (Type 6) have been recovered from respiratory tract secretions. Several infants harbored more than one agent. Serum antibody response, specific antibody in respiratory tract secretions or tears, viral flora of other family members, duration of viral replication, and excretion in the affected infants and, with the collaboration of the group working in Pulmonary Physiology, pulmonary function and ventilation are being studied.

4. With the Tumor Therapy Service, an investigation of varicella-zoster infection has been undertaken in children undergoing chemotherapy for their neoplastic disease, since this infection is a common cause of morbidity and mortality in this group of patients. Studies for the presence of virus in the patient, the development of antibody, and of the clinical response to plasma from convalescent donors are being conducted.

The following is a summary of experimental work done mainly during the period July 1, 1967 to October 1, 1968.

I. Experiments on Viral Infectivity and Cytopathogenicity

Further Investigations of the Effect of Cell Fusion Induced by Inactivated Sendai Virus *in vitro* on the Multiplication of Certain Agents in Naturally Resistant Cells. It was previously reported that poliovirus 1 multiplies in resistant hamster and chick cells after fusion of the cells is brought about by addition of ultraviolet irradiated Sendai virus. This basic observation has been extended and it has found that ECHO 7 virus can also be induced to multiply in resistant hamster cells in this manner. Inactivation of Sendai virus by betapropiolactone has proved superior to inactivation by ultraviolet irradiation, since this chemical completely and rapidly destroys all viral infectivity without impairing the fusion factor. In addition to confirming the growth of poliovirus under these conditions, it has been shown that poliovirus induces specific cytopathic change in the infected polykaryons formed as a result of fusion.

Since only RNA viruses which multiply in the cytoplasm were first studied, it became of interest to determine a DNA virus known to replicate in

the cell nucleus could be also induced to multiply in naturally resistant cells. For this purpose feline herpes virus and a line of human embryonic lung cells were chosen. The latter proved to be solidly resistant to the feline agent. In this cell system when the feline herpes virus was added and the cell fusion subsequently induced, cytopathic effects characteristic of herpes virus infection were seen. These included the formation of typical Cowdry Type A inclusion bodies. Virions morphologically compatible with those of herpes virus were seen by the electron microscope in the affected cells. No increase in infective virus, however, was associated with these other manifestations of infection. It was concluded, therefore, that while fusion allows entrance of feline herpes virus into the resistant cell and the further penetration of the viral genome into the nucleus, replication of complete virus is inhibited presumably at a late phase in the cycle. Interesting in themselves, these findings may find relevance in the solution of two recently defined problems: i.e. infections with the Burkitt agent, and the apparent association of measles antigen with subacute sclerosing panencephalitis.

Experiments with Rubella Virus. In an attempt to adopt rubella virus to a chick embryo cell system by preliminary serial passage in primary hamster embryo cells, 80 passages have now been carried out in the latter system. No evidence, however, has been obtained that the virus has acquired a capacity to replicate in chick cells. Additional attempts to promote the replication of the rubella agent by fusing the chick embryo cells with inactivated Sendai virus have likewise failed.

In the previous report a toxic effect apparently induced by rubella virus on chick embryo cells, growing in the presence of infected hamster cells, was mentioned. This interesting phenomenon awaits further analysis, but in a preliminary study it was found that exposure to suspensions of rubella virus, alone, although inducing no toxic changes, rendered chick embryo cells refractory to the cytopathogenic effect of Sindbis virus when subsequently added. This phenomenon has now been explored in some depth and it has been determined that the observed inhibition does not depend upon viral multiplication or the production to interferon, but requires the presence of infective virus. Induction of inhibition requires a latent period after the virus is added, and is prevented by sera containing antibodies to rubella virus and not by those lacking this antibody. The last mentioned feature of this inhibitory phenomenon offers the possibility of a new way of testing for the presence of rubella

antibody which, as indicated by preliminary findings, may be more sensitive than the techniques now used as routine for this purpose. This practical implication of these findings is now being actively investigated.

A group of institutionalized rubella-sero-negative children were vaccinated approximately one year ago with Meyer and Parkman's rubella vaccine. Together with 5 unvaccinated controls the persistence of rubella antibodies is being determined at yearly intervals. Sera have been collected for the one year determination.

Experiments *in vitro* on the Reaction of Human Blood Leucocytes to Vaccinia and Certain Other Agents. (i) Vaccinia virus experiments on the replication of vaccinia virus in human leucocytes have been completed. The experiments were designed to examine parameters which effect viral growth in these cells. The results showed that the continuous presence of phytohemagglutinin (PHA) was required for the multiplication of the virus. In the absence of PHA, viral adsorption and penetration occurred, but these events were followed by no significant viral replication. A cytopathic effect of vaccinia virus on leucocytes in the presence of PHA was also demonstrated. Evidence was obtained by separating leucocyte populations on glass bead columns, that the virus replicated mainly, if not entirely, in PHA stimulated leucocytes. (ii) EB virus. A continuous line of cells was established with elements from the blood of a child with acute leukemia. Tests for interferon demonstrated that the cells of this line regularly produced this factor. Examination of the line by the indirect fluorescence technique using sera positive for the Burkitt agent (EB virus) revealed the presence of the antigen. Attempts were made to establish clones from this line with the purpose of determining whether all cells of the line or only a few were associated with the EB agent. These attempts failed since under the cultural conditions employed it was found that approximately 10^3 cells were required to establish a subline. Experiments are in progress to determine whether contact with cells of the leukemic lines will result in the transfer of EB virus to leucocytes from a normal donor. Several attempts, using different techniques, to induce infectious virus production by lymphoblastic cells containing EB virus have been so far unsuccessful. These efforts will be continued.

Attempts to Propagate the Agent of Infectious Hepatitis. Continuing efforts to grow this agent *in vitro* have long been made in this laboratory. Two recent ones are as follows. Roller tube cultures of

fragments of placental tissue from a woman in the acute stage of hepatitis who delivered a premature infant, were maintained for several months. Fibroblastic out-growth of cells occurred, but no evidence of a cytopathic effect was observed. Subsequently cultures prepared with trypsinized cells from the placentas of normal deliveries were established and exposed to blood serum and urine derived from a patient with acute hepatitis. Some of the cultures were then treated with Sendai virus to induce fusion of the cells. Although the cultures were observed for many weeks and subcultures were made and similarly observed, no definite evidence of the presence of viral agent was obtained, although on occasion suggestive changes were noted.

The second recent attempt to demonstrate this agent consisted in overlaying normal placental cell cultures with washed leucocytes from patients with acute infectious hepatitis. No specific changes attributable to a virus were observed, although incubation of the cultures was continued for several months.

Isolation of Possible "New" Cytopathic Viruses. During a collaborative undertaking with Dr. G. J. Adelstein of the Harvard Medical School, which aimed to determine whether DNA viruses would replicate in the cells of the California Ground Squirrel (*C. lateralis*), which are characterized by an abnormal thymidine metabolism, an agent was revealed in cultures of the cells from normal animals. This agent which exhibits characteristics in common with the Herpes Virus Group, was isolated from 3 separate batches of animals. While the new agent shares characteristics in common with the group, it cannot be identified with any of the known members. The basic features of the agent have been defined. It is of interest that human immune gamma globulin failed to neutralize the virus but the serum for a worker who had had prolonged contact with ground squirrels did so. Further studies of the biological properties and of the virus are planned by Dr. Samuel Katz who will carry out this work at Duke University where he has lately become Head of the Department of Pediatrics.

Two agents which appear to be identical have been isolated from the respiratory tract of two patients in temporal relation to an encephalitic illness. These viruses exhibit in general, the characteristics of the parainfluenza group but serologically are unrelated to any of its 4 recognized members. On the basis of data now available it would appear that these agents may represent a 5th Division of the Parainfluenza Group.

II. Studies Concerned with Oncogenic Viruses

Studies on the correlation of S and T SV40 antigens with the development of oncogenicity. In the previous report the appearance of S (surface) and T, tumor antigens in lines of initially non-oncogenic hamster embryonic cells exposed to SV40 virus was described. In certain of the exposed lines only S antigen was detected while in others both S and T antigens were found. Neither of these antigens developed in the homologous unexposed lines maintained under the same conditions. All lines in which both antigens were present, or in which S antigen alone was observed, were subsequently shown to have become oncogenic as well as two unexposed lines homologous with two exposed lines that develop only S antigen. These experiments which were done in collaboration with S. S. Tevethia and Fred Rapp of Baylor University College of Medicine, have been published. The results were interpreted as providing evidence that the synthesis of S antigen is specifically determined (like T antigen) by SV40 and may take place independently of the synthesis of T antigen. Because of concurrent oncogenic transformation in homologous cultures not exposed to SV40, no association between capacity to synthesize only S antigen and the development of oncogenic potential was established.

Additional researches, therefore, were undertaken to obtain an answer to the question of whether cells exhibiting S but not T antigen are oncogenic. Another series of experiments, now completed was carried out to determine whether S antigen is to be identified with the "transplantation antigen of Habel and Klein, since the material at hand appeared to offer a favorable approach to this problem. To answer the first question, clones from one of the lines exhibiting both S and T antigens were prepared. Since in these lines the number of cells with T antigen was small compared to those with S antigen, none of the clones isolated contained T antigen. Tests for oncogenicity have recently shown that these clones do not induce tumors in hamsters. Tests for the presence in these clones of S antigen are not yet completed. If, however, this antigen is found, one might conclude that the synthesis of S antigen may occur independently of oncogenic transformation. Results of experiments designed to analyze the relationship between S and transplantation antigen will be published in the *Journal of Immunology*. In summary, they indicate that S antigen cannot be identified with the transplantation antigen.

Since only cells exposed to SV40 developed S antigen, the conclusion that the virus in some way

specifically determined the synthesis of this antigen appeared justified. However, the question remained as to the role of the virus. Synthesis of S antigen might either be coded for by SV40 genome present in the cell or the virus may act by "derepressing" cellular factors that inhibit the synthesis of a cellular antigen. Accordingly, in collaboration with members of Dr. Patrick Henry's laboratory at the National Institute of Health, Dr. Michael Oxman now working with us, has examined the relationship of SV40 gene function to the formation of S and T antigens in the lines of transformed embryonic hamster cells just mentioned. The method employed consisted of radiolabelling the cells RNA in tissue culture and hybridizing the extracted cellular RNA with denatured purified SV40 viral DNA fixed to Millipore filters. To date, only cells containing the SV40 T antigen have yielded SV40 homologous RNA, even under a variety of growth and labelling conditions. These findings favor the hypothesis that S antigen is the result of the derepression of a cellular genetic function and is not a virus gene product. The search for viral DNA in these same cell lines is presently under way, and in addition a detailed analysis of the acute infectious cycle of SV40 virus is in progress, utilizing pulse labelling of DNA and RNA, and DNA-DNA and DNA-RNA hybridization and hybridization-competition with purified viral DNA. "Early" and "Late" viral messenger RNAs are being compared by hybridization-competition techniques and each will also be compared with "viral" RNA obtained from transformed cells. The results of these investigations should cast further light on the problem of the relationship of the SV40 genome to the synthesis of S antigen.

Other approaches to the general problem of the mechanisms involved in oncogenic transformation by SV40 have been initiated in this laboratory. In one series of experiments Dr. Peter Tegtmeier is investigating the effect of temperature on the lytic and transforming effects of this agent. Only plaque purified virus is being used to avoid varied cell relationships with a heterogeneous population of virus. Cloned virus has also been exposed to a variety of chemical mutagens. A large number of subcloned from this mutagenized stock are being examined for temperature sensitivity. The ultimate aim here is to isolate single step mutants which can be divided into complementation groups. If obtained, each mutant group will then be tested for oncogenicity to determine which cistrons, if any, are required to initiate and maintain cell transformation.

In still another series of experiments concerned with the cell-genome relationship, the objective has been to demonstrate biologically, active SV40 genetic material in DNA extracts of tumor cells developing from the implantation of one of the T-positive, S-positive transformed embryonic hamster cell lines mentioned above. These tumor cells are inducible for SV40 virus when co-cultured with monkey kidney cells. Although a variety of modifications of techniques have been explored, no infective virus has as yet been recovered from monkey kidney cells treated with the extracts. The possibility that lack of success may be due to competition from cellular DNA is currently being examined.

Changes in Oncogenicity of SV40-transformed Hamster Cells After Prolonged Cultivation *in vitro* and *in vivo*. The study of changes in oncogenicity described in the previous report after a line of SV40 transformed hamster heart cells was serially passed *in vitro* and *in vivo* has been completed. The results have been described in a paper soon to appear in The Proceedings of the Royal Society. In brief, the results were as follows: the transformed line was shown to be composed of a population of cells varying in oncogenic potential. Although slight changes in oncogenic potential of the line were observed throughout a series of nearly 100 passages *in vitro*, no permanent or marked alteration in this property under these conditions was recorded. In marked contrast, the cells from tumors induced by the line and its clonal derivatives of initial low or moderate oncogenicity, demonstrated a uniformly high oncogenic potential as demonstrated not only by the smaller number of cells required to induce a tumor but by a marked increase in growth rate and the capacity to metastasize. Enhanced oncogenicity was retained after at least 12 passages of the tumor cells *in vitro*. On the basis of these findings it was suggested that at least two mechanisms were operative in the observed increase in oncogenic potential (OP): a) selection of cells of high OP among a population differing in this property and, b) cellular mutation from a lower to a higher level of OP. The data provided no indication that the viral genome present in the cells was responsible for the observed increase in OP. The availability of clones varying widely in oncogenicity would seem to offer excellent material for studies of biochemical and biological factors that may be correlated with differences in oncogenicity.

The Susceptibility of Adenovirus 12 Transformed Hamster Cells to Homo- and Hetero-typical Adenoviruses and Unrelated Agents. Early findings in the investigations mentioned in the last report

to determine the effect of superinfection by homo- and hetero-typical adenoviruses and by other unrelated agents on the cells from a tumor induced by adenoviruses Type 12, have been extended. The final results which have been published may be summarized as follows: Four distinct strains of type 12 adenovirus consistently initiated a marked cytotoxic effect on the tumor cell line, but not on unrelated hamster cell lines of normal origin or SV40 transformation. A correlation of the pattern of response elicited in the tumor cell line by heterotypic adenoviruses with their oncogenic potential and their hemagglutination subgroups was established. It was proposed on the basis of these findings that the resistance and susceptibility to infection of virus-transformed cells to viral superinfection may be another cellular trait governed by cell incorporated genetic material.

Experiments are in progress to determine the effect on the oncogenicity of the adeno 12 tumor cell line of passage *in vitro* and *in vivo*. The preliminary findings suggest that, unlike the SV40 transformed cells described above, the OP is diminished under both conditions.

III. Clinico-virological Studies

Studies on the Relationship of Measles virus to Subacute Sclerosing Panencephalitis. Brain biopsy or autopsy specimens from 8 patients with Subacute Sclerosing Panencephalitis (S.S.P.E.) were studied using tissue culture techniques in unsuccessful attempts to recover an infectious agent. The serum and cerebrospinal fluid (CSF) from these and additional patients were also analyzed for neutralizing measles antibody levels at intervals during their illnesses. The finding of unusually high titers was confirmed. A lack of a similar elevation in measles antibody titer among sblings and parents was documented. The effect of therapy with 8-azaguanine on the antibody level as well as the rate of reappearance of antibody, in the cerebrospinal fluid after complete replacement of spinal fluid, was studied. An animal model has now been developed by us, which may provide some answers to this enigma of measles virus behavior in nervous system tissue.

As another approach to the problem of the possible role of measles virus in S.S.P.E., attempts have been made using cultured human fetal astrocytes to induce a chronic measles virus infection comparable to a system using HeLa cells. The virus produced cytopathic changes in these cells consisting of clustering of nuclei and broad syncytia with intracytoplasmic inclusion bodies. Ultimately, the cultures were completely destroyed.

Effect of Certain Chemical Antimetabolites on Viral Infections. The antiviral activity of cytosine arabinoside and 8-azaguanine against herpes simplex and measles virus has been studied *in vitro*. In collaboration with workers at the Massachusetts General Hospital, the comparative effects of cytosine arabinoside, 5-iododeoxyuridine and uridine, 2-deoxy-5-(tri fluoromethyl), on herpes simplex encephalitis in the rabbit were evaluated, and this information is now being used in a continuing study of the treatment of this form of encephalitis.

Lowered CSF sugar in Mumps. Clinical recognition of lowered cerebrospinal fluid sugar in association with mumps meningoencephalitis not hitherto appreciated, has led to a description of several cases and a submitted report of the findings of a retrospective chart review. The viral isolations from the cases directly observed were accomplished in human kidney tissue culture.

A Case of Cytomegalovirus Infection Associated with Aplastic Anemia. A child was observed with excretion of cytomegalovirus in his urine at the time of his presentation to the hospital with an atypical hepatitis. The child progressed in his illness and developed aplastic anemia. Four months after the onset of his illness he continued to excrete cytomegalovirus, and preliminary work indicates that the virus was also present in his blood at this time. The child was studied in some detail before his demise.

Prolonged Infection with ECHO 9 Virus Associated with Agammaglobulinemia. A 25 year old man with well studied congenital agammaglobulinemia was admitted to the Children's Hospital with aseptic meningitis. ECHO 9 was isolated from his CSF on four occasions during a 6-week period prior to his death. At autopsy, his liver, spleen, lung, CSF, kidney and brain all yielded ECHO 9 virus. An evaluation of his interferon production by means of examination of blood serum and CSF is being completed as well as further studies of the ECHO 9 isolates.

Treatment of Varicella-Zoster Infection with Cytosine arabinoside. Three children with progressive varicella or disseminated Herpes Zoster were observed. Two of the children were leukemics and one was a child with defined alteration of delayed hypersensitivity. The children had a dramatic clinical response in temporal association with cytosine arabinoside therapy. All the children recovered completely from the viral infection.

Aseptic Meningitis. In the summer of 1968, at The Children's Hospital, approximately 48 patients with aseptic meningitis were studied. At present, 12

isolates have been recognized, and two identified as ECHO 2 and ECHO 12. The remainder of the isolates are being processed for identification.

Diagnostic Tests for Viral Infections. During the year (1967-1968) an estimated 500 cultures from 290 patients were processed. Approximately 20 isolates of herpes simplex, cytomegalovirus, adeno, ECHO, Vaccinia, and varicella viruses have been identified in addition to the studies mentioned above.

Orthopedic Research and Pathology

Jonathan Cohen, M.D.

The following report by Dr. Jonathan Cohen is included here with the explanation that Dr. Cohen occupies a senior position in Orthopedic Surgery and that of Orthopedic Pathologist in the Department of Pathology. His research activities are credited to both departments.

(Dr. Cohen has been associated with the Department of Pathology since shortly after World War II, and rose quickly to the rank of Chief Resident. From then until 1954 he was associated full, or part-time with the late Dr. S. Burt Wolbach who was an authority among other accomplishments in the pathology of the musculo-skeletal system. From 1954 until recently Dr. Cohen worked in the Jimmy Fund Building of the Children's Cancer Research Foundation in carrying out his research activities with the aid of support obtained through the Foundation and the Department of Pathology of the Hospital.)

During the present reporting period, there has been a gratifyingly stable situation with regard to technical personnel. Chemical work has been continued and somewhat amplified by Mrs. Vida Barrs; secretarial and some technical metallurgical work by Mrs. Inga Wittig, both full-time. Part-time services have been rendered, in photomicrography by John Carabitses, in histology by Miss Natalie Daniels, in metallurgy by technicians under the supervision of Drs. John Wulff and Charles Berg in the Department of Metallurgy at M.I.T., and in radium and calcium radioactivity by technicians at M.I.T. under Professor R. Evans; and in the Department of Legal Medicine under the direction of Dr. Constantine J. Maletskos. Animal facilities in the Surgical Research Laboratory were available and animal care was provided by Francis Lebrun. Animal experiments were somewhat curtailed owing to the restriction of animal space when an animal room previously under our direction had to be converted to housing of electron microscopic auxiliary equipment.

The continuing supervision of orthopedic surgical residents for variable periods of time prior to their performance of clinical duties provided the usual turn-over of professional personnel which has been an integral part of our activities since 1950. These residents are associated variously with projects in pathology, metallurgy or any of the other on-going work in this laboratory, although some of them have also been doing research studies in the Saltonstall Laboratory (orthopedic) of the Children's Hospital. A list of the residents attached entirely or in part to our work is as follows (after each name is the research topic on which he was working primarily):

Michael Goldberg	Teratology, as produced by injections of immune serum
Robert Poss	Tissue culture as an assay medium for metal toxicity
Richard Cronk	Metabolic capacity of devascularized cells
Barry Lindenbaum	Fretting corrosion on orthopedic metal appliances
John Ream	Orthopedic Pathology
David Greenleaf	Silicone rubber replacement of bone
Peter Weingarten	Tissue culture methods of assay
John Barrett	Pathology of bone
Philip Bernstein	Assay of bone grafts by mechanical testing measurements
Joel Kanter	Corrosion of metals in a biologically simulated environment
Howard Schwartz	Time lapse photographic methods in tissue culture assay
George Yerid	Information retrieval in bone pathology

The laboratory facilities occupied during the first nine months of 1967, while entirely satisfactory as far as they went, were somewhat cramped in view of the numbers of personnel using them and the need for animal space. In October 1967 the space had to be used for other purposes and our principal laboratory facilities were moved to a smaller area in the Interim building. These quarters had the advantage of being set up according to our specifications, but had the disadvantages of smaller size and less accessibility to the other areas where collaborative activities were daily taking place—e.g., the pathology laboratory, animal quarters, Saltonstall Laboratory, etc. Nevertheless, the transfer took place without interruption of work and without change in its character. Some slight slow-down has been the result of the inaccessibility of the laboratory to other labs.

Work in Progress

I. *Metals.* This laboratory has a continued program on the interaction between tissues and metals which has concentrated on the following aspects:

A) Assay of the tissue reaction. Because of the obvious clinical problems associated with the use of orthopedic hardware, including the degree of success or failure in the use of these materials in patients, studies have been made as follows:

1) The study of tissue removed from patients who have had appliances inserted, said tissue being that adjacent to the appliance. As of December 31, 1968 appliances removed from 615 patients have been studied, with tissue specimens available for most. Their periods of residence in patients varied between 1 month (our arbitrary minimum) and 20+ years. Some few analogous studies have been made on other metal objects such as shrapnel and bullet fragments from Viet Nam veterans, using techniques developed for the appliances. These studies have helped to amplify the development of the concept of tissue tolerance as levels of tissue activity permissible within specified time periods for the anticipated therapeutic interval during which the metal will be in contact with the tissue. It has further allowed extrapolation of this tissue reaction assay to plastics and indirectly to the large field of implanted devices using them — cardiac pacemakers and valves, vascular prostheses, etc. and by further extrapolation, to such devices in contact with tissues as lenses, catheters, etc.

2) Tissue content of metal ions. The mechanism of tissue irritation by implanted metal items is being studied by means of tissue analysis for metal ions derived from the alloys in contact with the tissue elements. Correlation of the content of individual elements from the alloys within cells is the objective of the method, but to date histochemical methods do not allow requisite quantitation. The quantitation which is being achieved, mostly as a result of experiments conducted in 1967 in collaboration with Mr. Kopito and using atomic absorption spectroscopy, yields results referable to tissue fragments whose morphological composition is variable, so that the intracellular and extracellular pools of individual elements cannot be distinguished. While toxicity of tissues to metal ions or to the numerous species of metal-element-containing radicles cannot be ascertained by such studies (but which are studied in tissue culture — see below) an appreciation of the distribution of the metal elements and coordinate morphology of the tissue reaction will affect the direction of the inquiry.

3) Tissue culture studies. Two of these, published during the period of this report, indicate the orientation of the work of the laboratory using this technique. We took advantage of the development in this laboratory of a method for manufacturing

powders of alloys with particle sizes under a micron (and therefore capable of entering cells and exciting continuing toxic effects within them). We worked out possible assay protocols but found that they did not correspond completely with the results of accumulated clinical experience. We then explored (and are exploring) ways to modify the protocol, such as use of time lapse photography on individual cells, to quantitate toxicity toward one cell at a time, instead of to statistical populations of cells where cell numbers rather than cell morphology or reactions are the gauge of toxic effects. This study is still on-going. We tried to grow cells on carefully prepared metallic surfaces to detect, if possible, by the geography of the cell growth whether the surface affected cell multiplication, spreading or morphology adversely. This study, recently concluded, was not successful. A number of other modifications of the tissue culture-crossing technique are planned.

B) Studies on metal. This aspect of the problem requires extensive metallurgical collaboration, with regard to professional consultation, instrumentation and technical help. Fortunately all three of these have been available through M.I.T. in the departments of Professors Wulff and Berg. They have provided the planning help, some of the departmental facilities and technical personnel and funds.

1) Studies on removed devices. Of the 615 devices available, selections were made for study of corrosion, breakage, or other mechanical problems. Since the actual number of items in these 615 cases is over two thousand, statistical studies of some reliability have been possible, although the sample from which these cases are drawn is necessarily a biased one (many implants are not removed, and many that are are removed for a variety of reasons). However, the accumulated experience with removed implants, particularly those where there was failure, provides direction for laboratory studies, three of which are now described.

1. Studies of fretting corrosion. See the publication on this subject authored by Cohen and Lindenbaum. In this study, we made use of testing machinery available in this laboratory plus some in Professor Wulff's and devised a protocol covering several aspects of this problem, known to be of clinical importance. A partial solution to the problem is suggested which may serve to improve clinical practice considerably.

2. A study of corrodibility of the metals now in use clinically was initiated in Professor Berg's laboratory with Joel Kanter, one of the Orthopedic

Residents undergoing a program of training — research. It was found that crack propagation in some of the metals in question can be markedly accelerated by the presence of microscopic corrosion foci, especially when such foci are still in contact with the original corrodent — in this case, sodium chloride solution in a simulated biological environment. From the metallurgical point of view, these findings must be pursued for their great relevance to marine use of metals. From the medical point of view, some possible preventatives to this process can be suggested which would require further research to warrant trial.

3. The interposition of plastic materials between metal surfaces to decrease corrosion was studied by Bernstein with Prof. Wulff. Industrial applications which seemed to parallel the surgical situation were adapted in laboratory pursuit of a method to avoid certain types of clinical failure when metal corrosion is the basis. These studies are still in progress.

C) Research-related activities involving metals. There are several ways in which the work described above is translated into action. Without our personal background and involvement in the research, the activities to be described would not be possible.

1. Participation in the achievements of the F₄ Committee of the A.S.T.M. (the Committee on Surgical Implants of the American Society for Testing and Materials).

a) During 1967 and 1968 this Committee elaborated a standard protocol for the experimental testing for tissue tolerance of any alloy that is to be considered acceptable for use in humans. The Committee, being composed of representatives from industry, the consumer, and all other interested organizations and individuals, is now in the process of balloting on this protocol and we have assurances that, if accepted (which is highly probable), this will serve the Federal Food and Drug Agency as a standard on which materials used for human purposes can be judged. The major effort in fashioning this protocol came from this laboratory. It represents the first instance where biological assay methods and standards are being incorporated into testing and standards routines, formerly restricted to engineering and industrial practices.

b) Other activities of the A.S.T.M. also pertain — standards have been elaborated and accepted for surgical metals, for dimensions of certain items, etc. Standards are being prepared for tissue tolerance to plastics, to methods for cleaning, packaging, finishing, etc. of appliances and devices for surgical use.

c) The American Academy of Orthopedic Surgeons in 1968 was asked to prepare a prospectus of the needs of the country as regards orthopedic surgery and its auxiliary services. One part of this report which is entitled A National Health Program for Orthopedics, stems from this laboratory and is entitled "Report of the Section on Services—Surgical Implants, Quality Control". It includes not only the description of present practices and present needs, but also a summary of research and teaching as they touch on the problem of surgical implants. Much of the substance of this report arises from the participation of this laboratory in the work of the Committee on Surgical Implants of the Academy of Orthopedic Surgeons. The functions of this Committee, which have very largely depended on the three laboratories represented, have been to provide educational material in this field to medical schools, post-graduate medical educational facilities, nursing and auxiliary medical professions, etc. Our laboratory has also served in investigating all cases of failure of metal appliances which were referred by members of the Academy to the Committee for that purpose. These appliances are included in the 615 cases mentioned above.

d) Services on the problems of implanted metal devices also include the working out of proposed legislation on that subject. During 1967 meetings were held under the auspices of the Department of Health, Education and Welfare to devise for the Administration appropriate new legislation in this field. The bill devised is now before the Congress.

e) The last research-related activity which should be mentioned is that of services rendered to the National Institutes of Health; the National Institute of Arthritis and Metabolic Diseases and to the Orthopedic Research and Education Foundation. In the former, services were rendered throughout 1967 and 1968 in connection with their committee on orthopedic research training grants, and in the latter, services were rendered in apportioning funds for research applications.

D) Pathology. This laboratory has served as a facility available to the regular pathology laboratory of The Children's Hospital Medical Center, where special orthopedic pathological problems presented themselves. Aside from routine coverage of material, consultations to the Department and to the Tumor Therapy Service, several projects were pursued summarized as follows:

1. A study of graded intramedullary injury to bone. With Dr. Mohinder Mital's assistance, a study was completed which has been published and which delineates the effects of various degrees of injury

to the marrow in rats. This study was designed to reveal the repair sequences which might be expected in intramedullary nailing of fractures in humans. It showed the deleterious effects of excessive reaming and indicated that the cells primarily responsible for repair do not arise from the endosteum as thought previously, but from the marrow and from blood-borne elements.

2. Studies of two post mortem examinations of patients with dyschondroplasia calcificans were completed and the pattern of degeneration and evolution of the lesions were clarified. A report on this study is in preparation with Dr. Poss.

3. A clinico-pathological study of chordoma in the thoracic spine of a child—an exceedingly rare lesion—was initiated when such a patient was seen and her tumor removed. This study has an intimate relationship to previous studies in this department of notochordal remnants and their pattern of persistence in children.

4. A clinico-pathological study of multiple hemangiomatosis of bone in a child with anisomelia and hemihypertrophy was initiated and is in process. This study reveals the effects on growth of the hemangioma and is one of the few studies where longitudinal records are combined with histological data. This is now in preparation for publication with Dr. Cope, one of the orthopedic resident staff.

5. A clinico-pathological report of hemangiomatosis of the palm causing a carpal tunnel syndrome in a child also is in preparation for publication.

6. Pathology-related activities.

a) The laboratory has been involved in the activities of the American Academy of Orthopedic Surgeons as they relate to Orthopedic Pathology as follows: an annual exhibit has been prepared for showing at the Academy Convention and also at the Conventions of the AMA and the American College of Surgeons, demonstrating instances of Bone Pathology. Twenty-one taped lectures with slides were prepared for national educational distribution (all residency programs) plus television (closed circuit) showings for medical schools, etc.

b) The laboratory also has been a key factor in composing questions for the American Board of Orthopedic Surgery and in conducting their examinations.

c) The Joint Committee of the American Cancer Society, in formulating its standards of grading of soft part sarcoma, has been relying on this laboratory as one of seven for the necessary data.

E) Clinico-pathological studies.

1. Further studies of bone cysts along the lines

suggested by previous work from this laboratory have been made possible by coordinating appropriate clinical material and opportunities with an experimental approach. This involves injection of radio-opaque dyes into the lesion, measuring and demonstrating outflow pathways, and showing of histological features. A theory of etiology based on anomalous development of vascular blocks has been elaborated.

2. The original studies from this laboratory concerned with radiation, and bone sarcoma as a consequence of radiation, were carried further on in the report published in collaboration with Drs. Sears and Tefft. Unusual morphology in a post irradiation sarcomatous involvement of a vertebra was documented.

3. Now under consideration is the use of bone-seeking isotopes as a therapeutic modality in osteogenic malignancies, when bone formation in the tumor outstrips that elsewhere. This possible therapeutic agency has been considered in relation to previous work done in collaboration with the M.I.T. radioactivity center, using the bone-seeking isotopes. The collaborative studies, now mostly stemming from the M.I.T. interests in radium poisoning and the accumulation of other radioactive bone-seeking isotopes in bone are still under way.

Our laboratory has tried to occupy a position midway between the basic laboratory researcher and the clinical investigator. We have steadfastly tried to have enough grounding and consultation in the three special areas of our interest, metals, bone pathology and radiation, to be able to confer meaningfully with the basic non-clinical experts in these fields while, on the other hand, we have also established a *modus operandi* in the clinical channels of care of patients, to apply our studies to selected patients and to pursue patient-related activities to improve over-all patient care. This has been done on an educational level, on planning levels, and operationally.

Division of Clinical Laboratories

Harry Shwachman, M.D., Director

Dr. Shwachman is Senior Physician in the Medical Service and Clinical Professor of Pediatrics at the Medical School. He is also a member of the Division of Laboratories and Research. He has the great responsibility of directing the Clinical Laboratories. There has been a constant increase in the demand on these laboratories, as can be seen from

the following figures on the total number of tests performed:

1966	245,795
1967	285,021
1968	354,568

The Clinical Laboratories have made an extraordinary contribution to the welfare of our patients and to the Hospital as a whole. When this Division was created in 1946, provisions were made to bring together all the isolated activities in this field, which were scattered throughout the Hospital, in addition to the much more organized and supervised Bacteriology Laboratories. By means of unusual effort and devotion Dr. Shwachman has supervised a group of technicians with all too small a professional staff. It should be emphasized that the lives of patients depend upon the accuracy of these studies. The Clinical Laboratory activities were put immediately on a satisfactory economic basis in 1946. This has been an important source of Hospital income, increasing through the years in a very satisfactory manner. In addition to Dr. Shwachman's duties as Director of these Clinical Laboratories, he and his associates have made research contributions throughout the years which have been both important and numerous. Working as the Director of Clinical Laboratories, and as a member of Dr. Janeway's Department of Medicine, he has made major contributions to our understanding and care of patients with cystic fibrosis. The account which follows of the research activities carried out under his responsibility and leadership, is taken verbatim from his own report. It should be here stated that Dr. Shwachman's contribution to the Hospital itself and to medicine as a whole represents a highlight in the history of the Children's Hospital and its Medical Center.

During the past few years a number of advances have been made in the field of metal analysis. Mr. Kopito's spectrochemical laboratory has developed new methods for measuring lead in urine, blood and hair. The chemical procedures formerly used were time consuming, complicated and required large sample size. In addition, the methods were less sensitive. The great advantage in having a rapid, relatively simple and less costly procedure of greater sensitivity is obvious in attempting to make the diagnosis of lead poisoning in an acutely ill child suspected of having this condition. At present our laboratory has the capability of accurately quantitating lead in urine, a very difficult procedure in the past or in most laboratories because there is normally very little lead. However, by our new technique, the concentration of lead can be

readily done. An analysis can be completed in less than 30 minutes. To be able to determine lead in urine rapidly makes it possible to treat patients more rationally since the dose of the chelating agent can be judged on the basis of the daily excretion. Also in cases where the diagnosis is difficult a provocative dose of a chelating agent may reveal the presence of excess lead in the body.

The determination of lead in blood may be very helpful in diagnosis if the level is elevated, but a normal value does not exclude lead intoxication. A brilliant achievement has been the demonstration that lead is stored in hair and that the assay of lead in segments of hair in one individual will reflect (a) the total amount of lead stored, and (b) the date or time of exposure. Since hair grows at a constant rate, measuring the distance of the segment from the scalp will date the time of the initial ingestion.

Of great public health importance is the applicability of this technique in screening studies for the detection of lead toxicity. In slum areas this can be used to pick out those that need help prior to the development of permanent or irreversible damage which may lead to or aggravate problems that may influence behavior, learning ability, etc. We are aware of the need to further explore this area and we plan to participate in a conference on lead poisoning to be held at the Rockefeller Institute next week under the chairmanship of Dr. Dubois. A project dealing with the screening of a large number of children in the Roxbury area was carried out this past summer. Dr. Crocker's department with Dr. Puschel as the active worker provided us with samples from over 800 children; abnormal amounts of lead in hair were found in more than 100 children. About 70 of these children were treated for plumbism. A report on this study will be presented before the American Pediatric Society in April 1969.

The spectrochemical laboratory also does the routine hospital determinations for Ca and Magnesium on a daily and emergency basis and whenever requested Cu or Zn in blood or tissue.

Our laboratory has been interested in developing simple and reliable tests for detecting cystic fibrosis in early life. We have been successful in dealing with any one patient suspected of having the disease. We have selected a high risk population for study, the newborn siblings of patients with cystic fibrosis. Over the past 10 years in over 200 pregnancies of mothers who previously gave birth to cystic fibrosis children, 50 or the expected ratio of $\frac{1}{4}$ matched the theoretical ratio of a Mendellian recessive. Since cystic fibrosis, if left untreated, can prove disastrous, we have been devoting some

time to the development of screening tests for the newborn. We have a good working relationship with the newborn nursery at St. Margaret's Hospital, one of the Boston hospitals with the largest number of deliveries. We are using two separate techniques; testing of meconium for the presence of albumin and (2) applying a skin electrode for measuring chloride. One test is performed on material sent to a central laboratory, whereas the chloride electrode is applied directly to the patient and involves the patient, a procedure public health authorities would prefer to avoid. Our studies on the meconium do not appear promising for wide scale adoption, whereas the newly developed chloride electrode by Orion Co. of Cambridge appears promising. We were the first to receive the newest

models of electrodes and the ones we now work with represent an improvement over earlier models.

Members of The Division of Infectious Diseases July 1, 1966—October 1, 1968

John F. Enders, Ph.D.	Chief
Samuel L. Katz, M.D.	Research Associate (to July 1, 1968)
George Miller, M.D.	Postdoctoral Fellow
Catherine M. Wilfert, M.D.	Research Associate
Peter Tegtmeyer, M.D.	Postdoctoral Fellow
John F. Griffith, M.D.	On leave from Department of Neurology, MGH
Michael N. Oxman, M.D.	Research Associate
Catherine A. Reznikoff, M.D.	Postdoctoral Fellow
F. Curtis Dohan, M.D.	Postdoctoral Fellow

DEPARTMENT OF MEDICINE

Charles A. Janeway, M.D.

As the Children's Hospital looks ahead to its second century, it may be worthwhile to look over our shoulders at the hundred years which have passed since it opened its doors to sick children on Rutland Street in 1869. For the first 51 years, the Hospital's patients were cared for with skill and compassion by practicing physicians who gave their services voluntarily. There were many distinguished men on this staff, as there are among the many practitioners who still serve on a voluntary basis. Thomas Morgan Rotch, Harvard's first Professor of Pediatrics and one of the first in the country, and his successor, John Lovett Morse, each acted as Professor and as Chief of the Children's Hospital's Medical Service, while maintaining a busy pediatric consulting practice. The loyalty and devotion of the large number of physicians who have given so generously of their time and energy for the children of this community for the past hundred years certainly deserves recognition, since it has done so much to give this Hospital the reputation it has achieved for combining professional skill with kindness in the care of children.

The end of the First World War meant the beginning of a new era in medicine, as in so many other fields. Science had begun to provide new tools for medical research, and it became clear that the clinical departments of teaching hospitals required full-time academic leadership. Dr. Oscar Schloss was lured to Boston in 1920 to become Harvard's first full-time Professor of Pediatrics and Chief of the Medical Service at this Hospital. Although Dr. Schloss, like so many other first incumbents of full-time clinical chairs, was given a rather unfriendly reception, he made two notable contributions during his brief tenure: first, he brought Dr. James L. Gamble from the Department of Pediatrics at Johns Hopkins "to study disease with the methods of chemistry," and he planned and built the first research laboratory building at the Hospital. This Laboratory Study Building was used for over 40 years till it had to be demolished to make way for the Fegan Building four years ago. When Dr. Schloss returned to New York, where he subsequently had a distinguished career as Professor of Pediatrics at Cornell University Medical College, Dr. Gamble's great friend Kenneth D. Blackfan, was brought from Cincinnati to become Professor at Harvard and Chief of the Medical Service. So the institution of a full-time chief and the establishment of the scientific study of disease in a clinical department (so-called clinical investigation) were the signs of a new era. This was followed by another development in which the Children's Hos-

pital was to become a real pioneer, specialization within pediatrics. This began when Dr. Bronson Crothers, who had been impressed with progress in neurology in Britain during his wartime experiences as a volunteer in the British Army Medical Corps, requested leave in order to study neurology and returned to establish the Neurological Unit for children in the Bader Building, where generations of pediatric house officers were influenced by his priceless gifts as a sympathetic physician and a provocative, disarmingly honest teacher.

An Heroic Era

The era of Blackfan, Gamble and Crothers between the two great wars was happily intimate — senior staff and the few house officers all being able to dine together every noon — but it was a heroic one. Dr. Blackfan's capacity as a teacher and organizer and his deep knowledge of clinical pediatrics stimulated many new developments. Dr. Diamond was launched on his career as a pediatric hematologist with Dr. Blackfan's personal interest and encouragement. A long-term study of the growth and development of children was inaugurated under the direction of Dr. Harold Stuart. Close cooperation with the Department of Obstetrics at the Boston Lying-In Hospital laid the groundwork for neonatal pediatrics. An excellent bacteriology laboratory was established, where Drs. Leroy Fothergill, Benjamin Carey and John Davies made important contributions to knowledge of infectious disease in children and where a number of physicians now holding important academic posts acquired a solid foundation for their pediatric training in a joint year of Pathology and Bacteriology. Engineering know-how was brought from the Harvard School of Public Health. Yaglou worked out the problems of control of environmental temperature and humidity for premature infants with Dr. Blackfan, and Philip Drinker and James L. Wilson, Dr. Blackfan's perennial Chief Resident, developed the respirator for victims of severe poliomyelitis. Ultraviolet light was used by Charles F. McKhann to control cross infections in the hospital, and applied by Dr. Edwin Wyman to the control of rickets by exposing infants to sunshine through "Vita-Glass". Dr. McKhann, with the collaboration of a protein chemist, Dr. Arda Green, prepared the first solution of purified human antibodies, Placental Extract, for passive protection against measles. Meanwhile, Dr. Gamble's laboratory, with a small group of fellows who have had distinguished careers in Surgery, Medicine and Pediatrics, laid the scientific foundations for modern parenteral fluid therapy, and thus

affected the lives of countless patients around the world. Finally, Dr. Blackfan's probing curiosity, and his collaboration with Dr. Farber in the outstanding Department of Pathology which had been established with Dr. Wolbach's backing and inspiration, led to the clarification of the morphologic and physiologic basis of a number of major pediatric problems, notably erythroblastosis fetalis and cystic fibrosis.

This great era came to a sad end on the eve of the Second World War, when Dr. Blackfan, an habitual chain smoker, died of lung cancer. After an interregnum, Dr. Richard M. Smith, a part-time physician at Children's who had started the Department of Maternal and Child Health at the Harvard School of Public Health and who had been a leader in the child health movement, took on the formidable responsibility of running the Department of Pediatrics and the Medical Service as a Part-time Professor, while continuing to care for his patients. With the help of associates like Clement Smith, Louis K. Diamond and John Davies, and a group of very able Chief Residents, Edward L. Pratt, William Barenberg, and the late Gretchen Hutchins Moll, Dr. Smith brought the Medical Department through a difficult period and handed over the reins in 1946.

During the 23 years which have elapsed since that time, the Department of Medicine has been caught in, benefited greatly from, and contributed to the enormous development of the Hospital which has taken place since 1947, when Mr. Farley enunciated its goal as the creation of a Children's Medical Center. Although progress toward that goal has not been steady, there have been two great spurts forward. The first came during Mr. Farley's Presidency, when the Medical Center was created as an organization, a series of new developments were implemented and the first campaign for funds culminated in the opening of the Farley Building under Mr. Howe's presidency in 1956. Now again, during the past few years under Mr. Wolbach's presidency, backed by Dr. Cronkhite's extraordinary executive ability and stimulated by Dr. Farley's broad vision, the institution has surged forward again. Pressures for space, which had become almost intolerable, are being relieved, and we are engaged in recruiting people who can strengthen our staff. They are needed to make us capable of using the opportunities provided by our beautiful new facilities, designed by the Architects Collaborative and given by the public, in the most effective way possible for the benefit of children. Facilities do not make an institution; people do, but good people

cannot stand frustrations for many years on end which hamper their ability to do best their work as clinicians, teachers or investigators. So, it is good to feel that we are moving forward as an institution with a momentum that is attracting good people to come here to work.

Development of Specialization

This may be a good time to review the development in the Department which have taken place during these last 23 years. In the first place, the development of specialties within pediatrics has continued at a rapid pace, and in two fields, Neurology and Psychiatry, this has led to the creation of new departments.

Pediatric Neurology

Pediatric Neurology at the Children's Hospital was initiated in the 1920's by Dr. Crothers and strengthened by Dr. Lennox's establishment of the Seizure Unit in the early 40's. This Neurological Division of the Department of Medicine was very ably led by Dr. Byers after Dr. Crothers' retirement. When the Bronson Crothers Professorship of Neurology was created by an anonymous gift, it was decided that its incumbent should be a member of the Department of Neurology at the Medical School and Chief of a separate service at the Hospital. The result is the strong clinical, teaching and research unit now headed by Dr. Barlow, a former Medical house officer, which gives consultative help to the Medical Service and still trains our junior residents on its ward.

Psychiatry was formally initiated as a clinical activity at the Children's Hospital in 1949 when Dr. Dane G. Prugh, now Professor of Child Psychiatry, University of Colorado, joined the Department of Medicine. The rapid growth of psychiatric activity in response to the urgent need for psychiatric service for children soon made it clear that this field deserved departmental status, and in 1953, this was achieved when the Judge Baker Guidance Center became affiliated with The Children's Hospital Medical Center and Dr. George Gardner assumed the three-fold position of Clinical Professor of Child Psychiatry (later full Professor) at the Harvard Medical School, Director of the Judge Baker Guidance Center, and Psychiatrist-in-Chief at The Children's Hospital Medical Center. The growth of the service, teaching and research activities of the Department under his vigorous leadership has shown the wisdom of the choice and has improved the total care of patients on all services. The Psychiatry Department has had great impact

upon the Department of Medicine because of the tremendous importance of psychological and learning problems in the modern practice of pediatrics and of emotional factors in the care of all sick children, but particularly those with chronic illness.

In addition to the development of these two new departments in the Hospital, the trend towards specialization to meet the special care needs of groups of patients and to permit us to exploit the challenges to research which their problems present, has led to the establishment of a series of special divisions within the Department. These can only be listed and their development and accomplishments cited in the briefest possible way.

1. Metabolism. Following the war, Dr. Gamble continued to provide inspiration to a series of "oncoming young men", who probed the biochemical problems of growth and their disturbances in disease. Among those he trained were the late William Wallace and Robert Schwartz, each of whom became head of one of the divisions of the Department of Pediatrics at Western Reserve University; Thomas Stapleton, Professor in Sydney, Australia, and Secretary-General of the International Paediatric Association; and Jack Metcalf, Chief of Pediatrics at Michael Reese Hospital in Chicago.

Subsequent developments in the metabolic area have led to the creation of two divisions in the Department, a Division of Nephrology (Renal Diseases) under Dr. Francis X. Fellers and the Endocrinology Division under Dr. John F. Crigler, Jr. These two divisions play a very important role in fulfilling the Hospital's role in caring for children with chronic diseases. Dr. Fellers' group is constantly called in consultation and maintains supervision of the long-term management of a very large number of children with chronic disease of the kidneys. Because of the frequency of renal disease and body fluid disturbances in the developing countries, Dr. Fellers' unit has proved to be a particularly suitable one for the training of fellows from these areas, many of whom now hold academic positions. Dr. Crigler's group likewise is responsible for the care of a steadily growing load of children with endocrine disturbances requiring long-term medical supervision and for working closely with the Department of Surgery in the difficult treatment of children with disorders of the sexual apparatus as well as with the Neurosurgical Department in the tremendously taxing post-operative care and subsequent supervision of children with craniopharyngiomas. In addition, Dr. Crigler and his associate, Dr. Fisher, play an important role in strengthening the clinical investigative programs of

all services through their management of the Hospital's General Clinical Research Center.

2. Neonatal Pediatrics. Under the vigorous leadership of Dr. Stewart H. Clifford, who directed clinical activities, and of Dr. Clement A. Smith, Director of Research in the Newborn at the Lying-In Hospital, the "premature nurseries" of the Boston Lying-In Hospital, and of the Infants' Hospital, were developed as separate but coordinated units. With this strong clinical and research base, the field of neonatology, which now occupies such an important place in every pediatric department, got off to a running start. Many leaders in the field throughout this country and abroad, like Gerald Nelligan in England, Petter Karlberg in Sweden, Alexandre Minkowski in France, and Charles D. Cook, Mary Ellen Avery, Marc Beem, Jerold Lucey, Nicholas Nelson and many others in this country have worked in the units. All pediatric house officers trained at The Children's Hospital Medical Center have had the benefit of the vigorous training in the care of the newborn infant which this academically based pediatric unit in an obstetrical hospital provided.

Dr. Clifford played a major role in organizing a national collaborative study, funded by the National Institute for Neurological Diseases and Blindness, of a large sample of women during pregnancy and of the development of their offspring for a period of at least seven years in order to determine, if possible, the effect of various perinatal events upon the subsequent neurological and intellectual development of the child. The Lying-in and Children's Hospitals were major participants in this MIH (Maternal and Infant Health) Study, which continues under Dr. Drorbaugh's direction at our Hospital. The study has clearly identified a number of factors in pregnancy and delivery which create a high risk for the child, and a great deal of important and useful data should ultimately be available as a result.

3. Hematology. During Dr. Richard Smith's term as Physician-in-Chief, Dr. Louis K. Diamond was enabled to devote himself full-time to the field which Dr. Blackfan had encouraged him to enter. The Blood Grouping Laboratory was established in 1943 by four hospitals to provide the service needed to exploit the discovery by Philip Levine, based on the fundamental work of Landsteiner and Wiener, that erythroblastosis fetalis was the result of incompatibility between the red blood cells of the infant and his mother. Through the development of exchange transfusion by Diamond and Allen, this facility has been instrumental in reduc-

ing mortality and morbidity from this major disease of the newborn, in rendering blood transfusion safer, and recently in the advancement of clinical genetics. In the Hospital itself, Dr. Diamond has not only provided expert care for children with blood disease, but trained large numbers of men and women, too numerous to mention by name, who now hold professorships here and abroad and who are leaders in pediatric hematology.

The process of specialization and the enormous burden of care required for patients with leukemia and other disseminated tumors under treatment with drugs, which followed Dr. Farber's epoch-making discovery of the effectiveness of a metabolic antagonist to folic acid in bringing about a remission of acute leukemia in children, inevitably resulted in the development of a separate Tumor Therapy Division under Dr. Farber's leadership and based at the Children's Cancer Research Foundation.

Another development which grew out of Dr. Diamond's interest in hematology, because of the genetic basis of many disorders of the blood in children, was the establishment of a laboratory of Clinical Genetics under Dr. Park S. Gerald, whom Dr. Diamond sent to England for training in the Galton Laboratory and for whom he raised funds to create very serviceable, although now seriously overcrowded research space in the Ida C. Smith Building. In addition to his notable contributions to the management of erythroblastosis fetalis, to the development of the field of pediatric hematology, and to the creation of an outstanding Division of Clinical Genetics, Dr. Diamond served the Medical School and the Hospital for many years with distinction as a teacher and as Associate Physician-in-Chief. Upon his retirement last September, his place in Hematology was taken by Dr. David G. Nathan.

4. Immunology. As a result of my own research training and experience during the War as a member of the team at the Harvard Medical School under the leadership of the late Professor E. J. Cohn, who developed the program of plasma fractionation, the efforts of my own laboratory turned to the study of plasma protein metabolism and clinical immunology. The group of fellows working with us included Niilo Hallman, Professor at Helsinki; Ralph Wedgewood, Chairman of the Department of Pediatrics at the University of Washington; David Gitlin, Professor of Pediatrics at Pittsburgh; and Walter Hitzig, Associate Professor, University of Zurich. Dr. Gitlin earned a world reputation for the brilliance of his work on the

metabolism of the plasma proteins and of the disturbances of the gamma globulins in the Antibody Deficiency Syndrome. The laboratory was forced to move four times in all, as the work developed, and its survival was made possible for several years through the generous loan of space by the Children's Cancer Research Foundation. When Dr. Gitlin left for Pittsburgh in 1963, Dr. Fred S. Rosen, who had been a house officer and a fellow, took charge, and under his leadership, as Chief of the Immunology Division, it is not only making important contributions to our understanding of immunological deficiencies and of the role of the complement system in disease, but is attracting an increasingly able group of young people for training in this rapidly expanding field, which has such important applications to infectious and collagen diseases and to the problems of transplantation.

5. Allergy. For many years the late Dr. Lewis Webb Hill presided over one of our largest special clinics — the Allergy Clinic — and taught many pediatricians about the clinically common but annoying field of allergic disease in an unforgettable way due to his keen mind, salty New England humor and transparent integrity. Upon Dr. Hill's retirement, Dr. Harry L. Mueller gave up pediatric practice and moved into the Hospital to provide service and teaching in this important field, in which he is a nationally recognized leader. An important development is a long-term special care unit for children with severe asthma at the Lakeville State Hospital under the supervision of his associate, Dr. Irving Bailit.

6. Infectious Disease. The creation of the Division of Laboratories and Research under the Chairmanship of Dr. Farber in 1947 led to several important developments for the Department of Medicine. One of these was the establishment of the Research Division of Infectious Diseases under Dr. John F. Enders. Dr. Enders, like Dr. Gamble, has pursued the life of the scientist scholar, remaining in his laboratory, where he has been extraordinarily productive in the study of viral disease. Although seldom seen on the wards, he has exerted an important influence upon our clinical work through the succession of fellows coming through his laboratory for training. Many of them have been pediatricians, who have provided a close link between the house officers, caring for sick patients, and the laboratory, where the patient's problem could be subjected to study. Among these men have been Thomas Weller, now Professor of Tropical Public Health at Harvard; Frederick C. Robbins, Professor of Pediatrics and Dean of the Medical

School at Western Reserve; and Samuel Katz, who has just assumed the Chairmanship of the Department of Pediatrics at Duke University.

Dr. Enders' laboratory has provided a wonderful scientific base for the biological study of viruses, and workers in the fields of pharmacology and experimental therapeutics in the Children's Cancer Research Foundation are now of great assistance to us in the chemotherapy of certain virus diseases. However, the bulk of infections, which account for much of the mortality and a vast amount of morbidity among our patients, are caused by bacteria. Their management today requires a deep knowledge of the biochemical and genetic properties of bacteria and of the mode of action of the ever-growing list of antimicrobial drugs required for their control. Dr. David H. Smith, a former Chief Resident, returned to the Department to develop this field two years ago after several years of intensive training with Professor Bernard Davis in the Department of Bacteriology and Immunology at the Harvard Medical School. Thanks to the availability of excellent laboratory space for a few years in the adjacent Shields Warren Laboratory of Radiobiology, he has been able to organize a vigorous research and training program in infectious diseases as Chief of our Clinical Division of Infectious Diseases. This group also carries one of the heaviest consulting loads in the Hospital.

7. Nutrition and Malnutrition. The problems of the child with the celiac syndrome, which was of such great interest to Dr. Blackfan, ultimately led Dr. Farber, through his pathologic studies and physiologic investigations with Dr. Harry Shwachman, to the delineation of cystic fibrosis as the commonest clinical entity in this group. After the Second World War, Dr. Charles D. May returned from service with the Harvard Hospital Unit in England to head our Medical Out-patient Department, and revived his investigative interest in this field. He was responsible for recognition of the tremendous importance of obstructive pulmonary disease with infection in patients with cystic fibrosis. His research fellow was Dr. Charles U. Lowe, now Director of the National Institute of Child Health and Human Development. With Dr. May's departure for the University of Minnesota and subsequently as a Professor of Pediatrics at Iowa and then at New York University, Dr. Harry Shwachman, who was Chief of the Division of Clinical Laboratories in the Division of Laboratories and Research, was asked if he would assume responsibility for the care of this group of patients. With characteristic energy and thoroughness, Dr. Shwachman has created the

largest, and certainly one of the best, units for the care of patients with cystic fibrosis and allied diseases, and has made an extraordinary series of contributions to the diagnosis and management of this major disease, which occurs with a frequency of about 1 in 1,000 births. As Chief of the Division of Clinical Nutrition, he has studied a number of other forms of malnutrition as well, such as celiac disease and congenital and acquired deficiencies of enzymes in the intestine.

8. Cardiology. This field acquired new significance with the demonstrations by Dr. Gross that major anomalies of the great vessels could be cured surgically and by Dr. Blalock and Taussig in Baltimore that the major blue baby syndrome, Tetralogy of Fallot, could be palliated by a surgical procedure. Suddenly the accurate diagnosis of Congenital Heart Disease in children became a matter of life and death rather than an intellectual exercise. The possibility of building up this new field at the Children's Medical Center was made possible by the Board of Trustees of the Sharon Sanatorium, who provided funds to support personnel and built the combined Medical and Surgical Ward (Division 35) known as the Sharon Cardiovascular Unit. Dr. Alexander S. Nadas, a former resident, who was practicing pediatrics in Greenfield, but who had had training in cardiology with Dr. Paul Wood in London, gave up his practice and returned to the Hospital, first as a Fellow in 1949. This was a very fortunate circumstance, for he has risen to world recognition as a leader in pediatric cardiology and created a Division of Cardiology which is probably the best pediatric unit anywhere. The development of a Cardiac Catheterization Laboratory for diagnosis and clinical research began with Dr. James Dow, trained by Lewis Dexter at the Peter Bent Brigham Hospital, next was run by the late Dr. Walter T. Goodale, then by Drs. Abraham Rudolph, Milton Paul, and Paul G. Hugenholz in succession, each of whom has since become head of a major academic unit. For the last few years Dr. Donald C. Fryer has provided splendid diagnostic service to our cardiac patients as Director of the Laboratory and as Dr. Nadas' clinical *alter ego*. Meanwhile, a laboratory for physiological cardiovascular research was created, first under Dr. Rudolph and since 1962 under the direction of Dr. R. Grier Monroe, who came from training in the Department of Physiology at the Harvard School of Public Health. With the creation of a center for Congenital Heart Disease under the direction of Dr. Robert E. Gross, with Dr. Nadas as Associate Director, cardiology has been further strengthened by

Dr. Richard van Praagh as Cardiac Pathologist and Dr. Olli Miettinen, in the Department of Epidemiology at the Harvard School of Public Health, as biostatistician. This strong team not only provides superb medical care to a large group of children with Congenital Heart Disease, but is productive in research and operates a training program through which a considerable number of the leaders in pediatric cardiology have been trained.

Pulmonary physiology, a field in which the Department of Physiology at the Harvard School of Public Health has been preeminent, has had increasingly important clinical applications. When the Mary MacArthur Memorial Unit was set up at the Wellesley Convalescent Home, with support from the National Foundation, to care for respirator patients, Dr. Benjamin Ferris served as the link between the Hospital and the Department at the School of Public Health. Following the move of this Unit to the Good Samaritan Building, Dr. Charles D. Cook established a very vigorous program in clinical pulmonary physiology in this Hospital. He trained a number of excellent people until he left to become Chairman of the Department of Pediatrics at Yale in 1964. Since then research in this field has been carried on by Dr. Mary Ellen Beck Wohl, who works closely with Dr. Jere Mead of the Department of Physiology at the Harvard School of Public Health, and by Dr. Warren Gold, who came here from training at the Institute of Cardiovascular Research of the University of California Medical Center at San Francisco to work closely with the Division of Cardiology on problems of the pulmonary circulation. Together these two have been extremely valuable to the Hospital as consultants for children with pulmonary problems, while the care of cases requiring assisted ventilation has been greatly strengthened by the activities of the Respiratory Therapy Service of the Department of Anesthesiology.

9. House of the Good Samaritan. At the same time as the Sharon Sanatorium joined the Children's Medical Center in the late 1940's and threw its resources behind medical and surgical work on behalf of children with congenital heart disease, the House of the Good Samaritan also joined and continued its dedication to care for, and to teaching and research upon, the major cause of acquired heart disease in children and young adults — rheumatic fever. This work had been directed with distinction by the late Dr. T. Duckett Jones for nearly 20 years, when he left to play a more important role on the national scene. In 1952, Dr. Benedict F. Massell, his associate, became Director of

Research, while Dr. Edward Bland continued his lifetime study of 1000 patients whose initial attack of rheumatic fever was treated at the House of the Good Samaritan. Although rheumatic fever is numerically less of a problem than it formerly was, it remains a very important disease all over the world. Hence, the presence of an active group, concerned with the long-term care and study of patients with a disease which may begin in childhood and not produce heart failure till the fifth or sixth decade of life, gives balance to our clinical and training programs in cardiology. In addition, the Good Samaritan played an active role in studies which demonstrated the efficacy of penicillin prophylaxis and steroid treatment of rheumatic fever. Since closure of the Convalescent Home at Wellesley, the wards of the Good Samaritan have become the long-term care facility of the Children's Hospital Medical Center, its laboratory serves the whole institution as a streptococcal reference laboratory, and its staff as consultants in rheumatic disease.

Growth of the Ambulatory Services

One of the most striking trends in the activities of our Medical Center has been the growth of its services to ambulatory patients. These fall into three main divisions in our department, which are linked together under the able direction of our Chief of Medical Ambulatory Services, Dr. Thomas E. Cone, Jr.

1. Medical Emergency Clinic

In 1946 patients coming to the Out-patient Department were quickly screened by a nurse with enormous clinical acumen (Miss Hedley) and those who seemed acutely ill or to have contagious diseases were shunted into a side room where Dr. Sylvester, head mirror over one eye, dealt rapidly with their complaints. Few records were kept. It was strictly an emergency operation. With the operation of the Medical Out-patient Department on an appointment system, the Medical Emergency Clinic became the place where all patients coming without appointment and no obvious surgical complaints were seen by our house officers and their findings recorded in the patient's unit history. The figures in Table I tell the story. It has become our busiest clinic, seeing nearly 300 patients on a particularly heavy day. This reflects a trend in all major cities, due to demographic changes accompanying the flight of doctors with their paying middle-class patients to the suburbs. So, our Medical Emergency Clinic is no longer just a place for emergencies but a general dispensary for those who

for one reason or another do not obtain medical care where they live.

2. Medical Out-patient Department

The Medical Out-patient Department serves as a diagnostic clinic to assist patients from this area with complex problems and chronic diseases to receive adequate evaluation and long-term management so as to promote their healthy development most effectively. The Chiefs of the Medical Out-patient Department over the last 22 years have been Drs. Charles D. May; Sydney S. Gellis, who left to become Chief of Pediatrics at the Boston City Hospital and later successively became Professor at Boston University and Tufts University Medical School; John W. G. Tuthill, still on our staff; Charles D. Cook, now Professor at Yale; Thomas E. Cone, Jr.; and for an interim year, Cathleen C. O'Brien. The clinic operates solely on an appointment basis, the morning clinic serving as a general diagnostic clinic, while the afternoons and some mornings are given over to special clinics. Over the years there have been striking changes: (a) a slow, gradual decline in the number of patients coming to the general clinic; (b) a marked change in the distribution of clinical problems referred for consultation to that clinic; (c) a steady growth of the special clinics. We believe that the first two changes reflect an increase in the number of pediatricians in practice in this area; they are competent to handle many medical problems previously referred by less well-trained general practitioners. However, the present generation of pediatric practitioners, trained on the busy ward services of our teaching hospitals, though splendidly equipped to recognize major disease in its early stages and to treat serious illness, have not been adequately prepared to manage the perplexing emotional, behavioral and learning problems which develop in their affluent, suburban patients. Thus these problems now make up a large proportion of the reasons for referral of patients to the Medical Out-patient Department. The growth of the special clinics, on the other hand, is a result of the same forces which have led to the proliferation of special divisions within the Department. The development of specific drugs and effective surgical procedures has led to survival of an increasing number of children with relatively rare chronic illnesses and handicaps — rare in the sense that an individual practitioner seldom sees more than a few in a lifetime, common for us because of their concentration in our special clinics. Supervision of the management of these patients, in cooperation with their

own physicians as far as possible, presents a challenge to research in an effort to improve therapy and a marvelous opportunity to give trainees — medical students, residents, fellows in a specialty and practitioners in postgraduate training — an experience in depth with the problems of care for children with chronic disease.

3. The Adolescents' Unit

In the late 40's, the staff, recognizing that adequate treatment for children with physical handicaps, particularly those affecting growth, required continuous supervision and treatment throughout the whole growth period, persuaded the Trustees to include care of adolescent patients in the goals of the projected Children's Medical Center. This was implemented in the Department of Medicine in the fall of 1953 by establishment of the Adolescents' Unit under the leadership of a dynamic and vigorous man, Dr. J. Roswell Gallagher, who had already become a recognized leader in this field on the basis of a long career as a school and college physician. With great energy, starting with a single office and secretary, he organized a service and teaching program which led to rapid growth of the Unit, as the needs he predicted became apparent, and its ultimate development into the model upon which a whole series of similar units were patterned across the country, many of them headed by those trained here. One of those whom he trained, Felix Heald, has not only become head of the adolescent program at the Children's Hospital of the District of Columbia, but Chairman of the Department of Pediatrics at George Washington University. Dr. Gallagher insisted that this clinic should be patient-centered, its focus upon the special needs of the adolescent as a patient rather than upon the special demands of his disease, and he gathered a consultant staff as teachers in this new field from other hospitals and departments as well as from this one so that it might become a focus for interest in the adolescent throughout the Medical School. From the Unit came several books which have become the bibles of adolescent medicine in this country. The success of this venture was assured by Dr. Gallagher's energy and determination, by the tremendous unmet needs for care of this age group, by the backing of the Hospital and the Medical School, and by grants from The Grant Foundation, the Commonwealth Fund, and other sources. Since Dr. Gallagher's retirement in September, 1967, his close associate, Dr. Robert P. Masland, Jr., has taken over direction of the Adolescents' Unit.

Outreach to the Community

The Children's Hospital and its successor, The Children's Hospital Medical Center, has always been concerned with the health of children in the community in which it is situated and in the larger national and world community. This local concern has been manifested by attempting to provide the best care possible for children who need it, regardless of race, creed, color or ability to pay. The more general concern has been expressed through the educational activities of its staff: training those who go out across this country and the world to minister to sick children and to teach others; writing books and scientific articles in an effort to improve the standards of practice; and answering innumerable telephone calls and letters from all over the world from distraught parents or puzzled physicians. At least three outstanding institutions, founded where children had great need for improved health services, owe their existence at least in part to the experience of those responsible for their establishment while in training here: the wonderful Children's Hospital and Institute of Child Health created by Dr. Fe Del Mundo in the Philippines; Hacetteppe University in Ankara, Turkey, which has evolved from a Department of Child Health in a two-room shack to a great focus of child health activity in the Middle East under the dynamic leadership of Dr. Ihsan Dogramaci, who is now Chairman of the Executive Committees of UNICEF and of the International Paediatric Association; and the new Child Health Centre in St. John's, Newfoundland, created by the vision and energy of Dr. Clifton Joy, who even had to enter Parliament to achieve his goal, which was made possible by the backing of Premier Joseph Smallwood and the Canadian Paediatric Association.

1. Affiliations with Community Hospitals for Residency Training

Over 20 years ago the Department of Medicine began to experiment in trying to assist in the improvement of pediatric care in the New England area through affiliations for training of residents with leading community hospitals. This has involved affiliation with the following institutions over the years: the North Shore Children's Hospital, the Beverly Hospital, the Beth Israel Hospital, the Mount Auburn Hospital (until very recently), the Rhode Island and Roger Williams General Hospitals of Providence, the Springfield Hospital, and until a few years ago the U.S. Naval Hospital, Chelsea. This program has undoubtedly helped in the recruitment of residents for those hospitals

with their own residency programs who can send their students to us for part of their training. In addition the program has provided residents to another group of hospitals which could not mount their own programs.

2. Family Health Care Program

This program was established in 1955 with strong backing from Dean Berry, in cooperation with the Departments of Obstetrics, Medicine and Psychiatry of the Harvard Medical School and with the Boston Lying-in and Peter Bent Brigham Hospitals, in order to provide experience in comprehensive primary health care of families in the community. It was initially made possible by a six-year grant to the Harvard Medical School from the Commonwealth Fund. Its first Director, Dr. Robert J. Hagerty, now Chairman of the Department of Pediatrics, University of Rochester, developed a program with the following characteristics:

- (a) Care was continuing, family-focused, comprehensive (i.e. it included both health promotion and treatment of disease) and included ambulatory (home and office) as well as hospital care.
- (b) Care was rendered by a health team, consisting of a physician (pediatrician or internist), public health nurse and social worker, and later a nursery school teacher for studies of child behavior in selected cases; of course, the help of specialists was sought in consultation when necessary.
- (c) The program's primary purposes were academic: first, to give physicians in training an opportunity to learn the skills required for family (pediatric, medical or general) practice under supervision; second, to permit research upon the problems of family health care, which is not possible in the wards or clinics of the Hospital.

As it has evolved over the years, the program has provided educational experience for the following groups of physicians in training: (a) medical students in the regular pediatric course and those who have taken an elective course in family medicine for a whole academic year; (b) residents in training for careers in pediatrics; (c) fellows in advanced training for academic careers in Family (Community) or Ambulatory Medicine; (d) general family practitioners on "sabbatical" leave from their practices for a year. These programs have provided a number of people who now head ambulatory services or family care programs in other medical

schools, where they have been developing rapidly to meet the growing concern for redressing the balance between the teaching of hospital-based disease-focused medical care and of community-based family-focused care.

Once the service and educational programs were established, clinical and epidemiological research was encouraged and has been an important part of the Unit's activity since 1960. Finally, in 1964, a Medical Care Research Unit was established under the direction of John Kosa, Ph.D., a distinguished sociologist who came here from the University of North Carolina to head the Unit. This Unit, which now includes three full-time sociologists as well as physicians on its staff, has been established to measure as accurately as possible many aspects of the delivery of medical care to families in the community. Their first major study is an attempt to evaluate whether or not such family-focused comprehensive care, as the Family Health Care Program has provided, actually has influenced the morbidity, health habits and care patterns of families. The findings will be of tremendous importance, because such programs to provide health care on a massive scale are being financed in most of our major cities with heavy government subsidy without clear evidence of their effectiveness. Present support for both the training program and the research unit comes from two separate grants from the Children's Bureau as well as from the Family Health Foundation of the American Academy of General Practice.

Dr. Haggerty left for Rochester in 1965. Since then Dr. Joel J. Alpert has served ably as Director of the Family Health Care Program.

3. *The Martha M. Eliot Family Health Center*

Another much more service-oriented outreach to the community is the Martha M. Eliot Family Health Center. Here, under the leadership of Dr. Eva Salber, a group of full-time physicians on the staffs of The Children's Hospital Medical Center and the Boston Hospital for Women (Lying-in Division), with extensive collaboration with nurses (VNA and City), social workers and nutritionists, are providing comprehensive, continuing maternity, infant and child health and medical care to a defined population of more than 7,000 people living in certain census tracts of the City of Boston. The area covered is one where maternal and infant mortality has been high, doctors lacking, and is one from which many of those who use our Emergency Clinic have come. The Emergency Clinic provides back-up service on nights, holidays and week-ends when the Center is closed. Financing and adminis-

tration are complex, involving the Medical School and School of Public Health, two hospitals, the Health and Housing Departments of the City of Boston, the State Department of Public Health, and the Federal Government. Nevertheless, the morale of those who work in the unit is high, its services are greatly appreciated by the community, and the relations between the Policy Committee, representing the agencies and institutions involved, and the Health Advisory Committee, representing the community being served, have been comfortable.

Patient Care Activities within the Hospital

The great fear in the operation of children's and infants' hospitals in the past was cross infection, and, on the assumption that it might be introduced by visitors, parental visiting was severely curtailed, while nurses, doctors and ward attendants tried to provide the TLC (tender loving care) which is as essential to a small child as the food he eats and the air he breathes. With prodding from child psychiatrists, pediatricians began to appreciate more fully the emotional needs of children and the fantasies and fears which separation from home and family and the painful experiences of illness and operations evoke. Our interest turned to this area when Dr. Prugh joined the staff in 1949, and a study was inaugurated in old Ward I Upper to compare the behavior of children during and after hospitalization, when one-half of the Ward was operated as before as a control (visiting for only two hours on Saturdays), while the other was operated on what we thought were sound psychological principles. These included daily visiting by parents, their participation in care of their children, provision of a wonderful nursery school teacher (Miss Elizabeth Staub) as a mother substitute, and adequate play opportunities to permit the children to ventilate their fears through play and drawing. The results of this study, made possible by a grant from the estate of the late Harold F. Brenton and published in 1953, clearly indicated the emotional impact of hospitalization on all children, but particularly those in the preschool group, and the partial effectiveness of the measures taken for the experimental group in diminishing emotional reactions to hospitalization.

This was the beginning of a development which has gone on ever since. With the strong backing of the Nursing Service and a great deal of encouragement from the Department of Psychiatry, a play therapy program was inaugurated and gradually spread to other wards until it is now universal. Visiting was liberalized, occasional rooming in of

mothers was encouraged where the facilities permitted it, and social service workers, backed by Miss Maginnis, played an increasing role in working with families of the children. In 1964, it became apparent that these multifaceted activities required some coordination to be maximally effective in improving total care of the sick child and minimally disruptive of the child's medical care. Dr. Helen Glaser, experienced in both pediatrics and child psychiatry, was appointed Coordinator of Patient Care, with Dr. Cronkhite's backing. She did a splendid job until she left Boston with her husband in 1967. At that point, Dr. T. Berry Brazelton, a practicing pediatrician with unusual experience in child development and in working with child psychiatrists, was appointed in her place. Many fine further developments were instituted by him, such as conferences held in rotation on various Hospital wards, at which doctors, nurses, psychiatrists, social workers, play therapists, school teachers, and occasionally representatives of outside social agencies, meet to discuss the total management of some child on the ward and to plan for his future continuing care in such a way that not only is a solution found for his problem, but much is learned that will help us with future patients. Dr. Cronkhite deserves great credit for recognizing the importance of these activities, which contribute so much both to the care of our patients and to the training of physicians, nurses and other personnel in dealing most constructively with the children entrusted to their care.

Highlights of the Period 1966-68

A. Clinical Service

The statistics presented in Tables I and II compare the service activities of the Medical Ambulatory and In-patient Services for the past two years with those for the two preceding years as well as with those for 11 and 21 years ago. Table I shows that the volume of our Ambulatory Services has tripled in 21 years, mainly because of increases in the number and size of special clinics and the enormous growth of the Emergency Clinic. Table II shows that the volume of In-patient Services, in both short- and long-term divisions, has leveled off over the past four years, probably because our facilities have been used almost to capacity throughout that time. It is significant that, whereas the Medical Services account for but one-third of the Hospital's admissions, the Medical Ambulatory Services make up 45-48% of the total for the whole Hospital, and these figures do not include a number of combined clinics, like those for cerebral palsy, mental retardation, arthritis and hemophilia, where the Medical Service plays an important role. The

mortality figures given in Table III are fairly constant for the past four years; the tremendous preponderance of neoplastic disease, heart disease and congenital malformations as the major causes of death reflects this hospital's role as a court of last appeal for children with serious life-threatening diseases. One figure not shown in these tables is that about 40% of admissions to the Medical Wards come from the Emergency Clinic. This indicates the extent to which we serve as a community hospital for the children of Boston, in addition to our role as a referral hospital for difficult cases.

These figures indicate the heavy load of service which must be provided by our staff and by the interns, residents, and fellows who work with them. But they do not tell the whole story, because the nature of the cases is such that they require more attention from doctors, nurses and other technical personnel and far more laboratory and radiological service than would be expected for an ordinary case of illness in a child. In addition to those doctors immediately concerned with the patient, the services of several consultants are often required in order to provide optimal care. Because of the growing size and complexity of the Department's activities, responsibility for supervising the clinical services has been divided between two senior, experienced physicians, whose abilities have been recognized by their appointments as Clinical Professors of Pediatrics at the Harvard Medical School; Dr. William Berenberg serves as Associate Physician-in-Chief and Chief of In-patient Services and Dr. Thomas E. Cone, Jr., as Chief of Ambulatory Medical Services. In addition, Dr. Berenberg serves as the Department's coordinator for activities on behalf of handicapped children, which includes interdepartmental committees, supervising and advising on the programs for cerebral palsy and mental retardation (under Dr. Allen Crocker), and speech and hearing disorders.

Dr. Berenberg and I lean very heavily upon Dr. Sherwin Key, who, as Assistant to the Physician-in-Chief, continues to give day-to-day support and supervision to the house officers, and whose loyalty and devotion to the Hospital have been responsible for many improvements in the care of our patients.

In the Ambulatory Services, Dr. Cone, who played a considerable role in planning the Fegan Building, has done a great deal to upgrade the quality of service given to our patients in that wonderful facility, where we can now treat patients from all social strata with pride, dignity and efficiency. He has brought about much better coordination between the Medical Emergency Clinic, the Medical Out-patient Department and the Adolescents'

Unit in service and training. And he is working to develop better techniques for handling the increasing volume of emotional, developmental and learning problems referred to us for help.

B. Teaching and Training in Pediatrics

One of the most encouraging trends in the last year or two has been the increased appeal of pediatrics to medical students generally and to those at the Harvard Medical School in particular. The quantity and quality of applicants for internship has risen strikingly. As a result, we have tended to take a larger proportion of our first year house officers as interns directly from medical school rather than as residents after a medical or rotating internship. Another encouraging trend has been the assumption of increased responsibility by the house officers themselves for improving the quality and interest of their work through the Medical House Officers' Association, formed last year and now functioning in a very helpful way.

The basic two years of our training program still represents a rigorous, intensive introduction to a pediatric career, with greater emphasis upon general pediatrics in the first year and upon specialized pediatrics during the second year. Most people want a third year of clinical training, and now three options are open to them, providing considerable flexibility for their differing interests and needs: (1) senior residency on the in-patient services, involving supervision of house officers and medical students on the general medical services, medical consultations on other services, and an elective period of 3-4 months; (2) senior residency in the ambulatory services, utilizing the opportunities in the various ambulatory care programs, in preparation for a career in practice or teaching of ambulatory pediatrics; (3) fellowship in family health care or in one of the many special fields of pediatrics in which this institution is so rich.

For many years the Children's Hospital has attracted foreign physicians for training in pediatrics, some of whom are among its most distinguished and influential alumni today. Following the Second World War, there was a great increase in the numbers seeking such training. Under Dr. R. Cannon Eley as Director of Postgraduate Education, courses were organized through which many foreign physicians got their introduction to American pediatrics. His departure in 1963 to assume the chair of Clinical Pediatrics at Brown University left a great void. In 1967, Dr. Berry Adels, a former house officer, joined our staff as Director of Postgraduate Education, to coordinate postgraduate teaching and par-

ticularly to improve our educational program for foreign physicians. Dr. Adels has reorganized our program of affiliated residencies with community hospitals, provided a weekly seminar for our foreign residents in order to stimulate them to relate what they are learning here to the problems they must face upon their return, and has represented our department to the Office of Courses for Graduates at the Harvard Medical School.

The reorganization of the affiliated residency program into what we now call the Coordinated Residency Program came about as a result of a study of the program by Dr. Adels during his first six months here. It utilizes three hospitals besides our own—the Beth Israel Hospital, the Beverly Hospital, and the North Shore Children's Hospital. The latter, which has an active pediatric service in its new plant adjacent to the Salem Hospital, has become our main focus of teaching outside our own hospital. Here, four of our affiliated residents work for three months under the supervision of our second year house officers who are assigned to this responsibility for one month each. One of our senior staff members spends one morning a week there, first, in a teaching conference with their staff and then in making teaching rounds with the residents, while one of their staff members participates in hospital activities at this hospital for a month at a time. While at the Children's Hospital, where they spend more than half their time, the affiliated residents get a varied experience which includes both in-patient and out-patient experience. Sixteen residents were chosen for the year 1967-68, and not only had a better educational experience than their predecessors, but were able to participate much more effectively in the clinical work in this hospital and the three affiliated institutions. An increasingly large number of applicants, not all of whom are foreign, have applied for this coming year, and we believe that this program will fill a real need, both for those who seek training and for the affiliated hospitals. These institutions, as well as those who send us affiliating residents, have been helpful in working with us to improve training and have assumed a major share of the educational costs of this program.

Dr. Adels was responsible for the organization and running of a highly successful five-day postgraduate course for physicians given by the whole hospital staff and a few invited guest lecturers last September. A total of 114 physicians from 38 states and seven countries attended, and were enthusiastic, judging from their written comments. This is an important annual event, like the equally successful

course in Adolescent Medicine, organized by Dr. Masland last May. These courses provide an excellent opportunity for practitioners from all over the country to see the Hospital and its work and to meet its staff members.

C. *Divisional Activities*

Space does not permit a detailed recital of all that has gone on in the various divisions of the Department during the past two years, but we shall attempt to give a bird's eye view of developments. The divisional activities can be grouped into several broad categories, which represent the areas in which members of the department are making contributions which will hopefully have an important impact on the future of pediatrics.

1. *Genetics, Hematology and Immunology*

One important dividend from the demolition of the old Laboratory Study Building was that a number of Medical Research Laboratories — Hematology, Immunology, Clinical Genetics, and Renal — were brought together in temporary but modern quarters above the Hyperbaric Chamber. This has facilitated the sharing of expensive equipment and improved efficiency, but most of all it has brought together a critical mass of investigators with overlapping interests which has been productive in research and has greatly strengthened our research training program. The recognition of Dr. Park Gerald's accomplishments in Clinical Genetics by his promotion to Associate Professor with life tenure guaranteed by the Hospital has given us a strong "anchor man" for this group. With support from the National Foundation, the John A. Hartford Foundation, the National Institutes of Health and the Children's Bureau, he has developed a research program which has as its basic aim the mapping of the genes on human chromosomes. From this has come: (a) improved care and counselling for parents of children with congenital malformations or other inherited disorders; (b) a prospective study, at the Boston Lying-in Hospital, with Dr. Stanley Walzer of the Department of Psychiatry, of the personality development of apparently normal infants found by a screening program to have abnormalities of the sex chromosomes; (c) better teaching of human genetics at the Medical School, for which Dr. Gerald has been responsible.

In the field of Hematology, Dr. David Nathan, who succeeded Dr. Diamond as Chief of the Hematology Division this year, has built up a strong biochemically-oriented research and training program, while carrying on the splendid traditions of clinical service established by his predecessor. The research goals are: (1) to determine the chemical

basis for the various disorders of the red cell, which are mainly hereditary, which produce hemolytic anemia so frequently in children; and (2) to determine the fundamental nature of the inherited defect of the phagocytic white blood cells which produces diminished resistance to certain types of infection. The group, which has established close contacts with biochemists and protein chemists at the Medical School and in Cambridge, has made notable advances during the past year in its attack on these two broad problems, on the first through the work of Drs. Nathan, Shohet and Kan, and on the second through the works of Drs. Nathan and Baehner, with Dr. Manfred Karnovsky at the Medical School. This existing program of research and training is financed by grants from the National Institutes of Health, the John A. Hartford Foundation, the Medical Foundation of Boston, and from several private donors, particularly Miss Charlotte Ward.

Closely allied is the work in Immunology under the able leadership of Dr. Fred S. Rosen. Training is financed by a joint grant from the National Institutes of Health to this institution and the Robert Breck Brigham Hospital, which administers it, where Dr. K. Frank Austen of the Department of Medicine has an active research group. The research aims of the Immunology Division may be summarized as: (1) elucidation of the pathogenesis of the increasing number and variety of immunological deficiency diseases now being recognized and the development of more rational treatment for them; (2) study of the structure and biosynthesis of the antibody globulins; (3) study of the role of the complement system in human disease. Several important advances during the past two years were: recognition of three new types of immunological deficiency by Drs. Rosen, Kretschmer, Alper and Kevy; extraction of immunoglobulins and globulin fragments from lymphocytes for the first time by Dr. Merler; and elucidation of the pathogenesis of the episodes of swelling due to altered vascular permeability in hereditary angioneurotic edema by Drs. Rosen and Klemperer working with collaborators elsewhere. Financial support for the research program has come from the National Institutes of Health and the Charles H. Hood Dairy Foundation.

An important component of the research program in this broad area is the Blood Grouping Laboratory, providing identification of genetic markers in red cells and plasma proteins. Dr. Chester Alper, who is in charge of the plasma protein work, plays an invaluable role as a colleague who is expert in systems of protein characterization and in turnover studies of the metabolism of specific plasma proteins.

2. Infectious Disease

Two years ago our first joint training program with the Department of Medicine of another hospital was inaugurated, with support from the National Institutes of Health, in the field of infectious disease with the Beth Israel Hospital, our portion being directed by Dr. Samuel L. Katz. When he left last year, Dr. David H. Smith assumed this responsibility with the able assistance of Dr. Catherine Wilfert, who had been trained by Dr. Enders and Dr. Katz. This program has been successful in attracting top-flight young people as fellows and in improving clinical care of patients with infectious disease in both hospitals through its teaching and consultation services. Dr. Smith's research program, financed by grants from the National Institutes of Health, the Milton Fund of Harvard University and the Lilly Research Laboratories, has been directed at the very fundamental problem of how bacteria develop resistance to antibiotics, which is of great importance to the practical use of antimicrobial drugs in the treatment of infections in patients. In addition, Dr. Porter Anderson in his laboratory is working on the development of an immunizing agent for the prevention of infections due to *Hemophilus influenzae*. The addition of Dr. Smith's interest in bacterial infections, and their understanding in terms of the modern knowledge of bacterial genetics and physiology, to the expertise in viral diseases already provided by the presense of Dr. Enders' laboratory has given the institution the sort of program which is needed by all services, where infections are a constant threat to the many seriously ill patients undergoing new forms of medical or surgical treatment.

3. Cardiology

Closely allied to infectious disease is the problem of rheumatic fever, generally accepted as a tissue response in certain predisposed individuals to infection of the throat by hemolytic streptococci. Dr. Massell's group in the Rheumatic Fever Research Unit of the House of the Good Samaritan has had two main goals: (1) constant monitoring of the natural history of rheumatic fever and rheumatic heart disease in order to permit the evaluation of new methods of treatment; (2) study of the effectiveness of methods aimed at preventing the streptococcal infections which initiate the disease. Although penicillin has been shown to be useful in clinical prophylaxis of infection, exploration of a more biological approach has always seemed worthwhile. With Dr. J. Gabriel Michael, who left to become Associate Professor of Microbiology at the Univer-

sity of Cincinnati, Dr. Massell has been able to show that it is possible to establish immunity in children with a streptococcal antigen preparation, but that there are possible risks which must be carefully studied. Dr. Bland's long-term studies of the course of rheumatic fever in patients observed for 30 years or more, and Dr. Czoncizer's studies of various clinical aspects of the disease round out the research program, which has been made possible by grants from the National Institutes of Health, the Massachusetts Heart Association and the pharmaceutical industry, and underwritten by the Board of Managers of the House of the Good Samaritan in arranging its merger with the Children's Hospital Medical Center.

The Cardiology Division is primarily concerned with congenital heart disease. As the diagnosis and treatment of the commoner malformations has become standardized, attention has turned increasingly to the management of small babies with severe malformations of the heart, formerly considered in operable or too severe to permit survival until an age when surgical treatment might be possible. Funds have been requested from the Children's Bureau to organize a regional program for New England which would permit infants with serious congenital heart disease to be evaluated and sent to the most appropriate center for treatment with a minimum of delay. This institution will serve as the place for treatment of the most difficult cases under the direction of Dr. Bernhard (Surgery) and Dr. Fyler (Medicine). At the other end of our age spectrum, Dr. Zaver has developed a program, supported by a grant from the Vocational and Rehabilitation Services of the Department of Health, Education and Welfare, to determine the physical capacity and intellectual performance of cardiac patients in the teenage group so as to guide them into educational and vocational programs best suited to their work capacity and interests. Many other research programs are in progress: studies of an artificial heart to assist the circulation, measurements of heart volume, studies of the response of the heart muscle to various drugs and stimuli, development of apparatus for visualizing the interior of the heart, and studies of the pulmonary circulation under various conditions in which cardiac function is abnormal. Finally, the Division of Cardiology is cooperating in an important national study of the natural history of various congenital cardiac malformations, so that before surgical treatment is applied to every patient, the cardiologist may be able to determine which patients really need surgical treatment, with its inevitable attendant risks. Dr. Van Praagh has an

active investigative program on the embryological origin of congenital cardiac malformations and, like Dr. Grier Monroe in cardiovascular physiology and Dr. Warren Gold in pulmonary physiology, is actively engaged in strengthening the scientific background of those fellows in training for careers in cardiology. With expertise in biostatistics and mathematics, Dr. Miettinen provides mathematical exactness in the clinical and laboratory studies of this active group. Support has come from the National Institutes of Health, the John A. Hartford Foundation, and the American Heart Association.

6. *Clinical Nutrition*

Dr. Shwachman's work in the field of nutritional diseases has already been cited. Because his group has done such an effective job in the care of patients with cystic fibrosis, the case load of their Cystic Fibrosis Center has steadily increased. In order to meet the patients' care needs more effectively, regionalization has been attempted by the establishment of collaborating subcenters in other New England cities. Twenty years ago the survival of any patient with cystic fibrosis beyond the age of five was a rarity. Today care has improved to the point where an appreciable number of these patients have reached adult life, and the rather remarkable observation has been made that, whereas a number of female patients have married and had children, the males have turned out to be sterile. With Mr. Louis Kopito, an expert in atomic absorption spectroscopy, Dr. Shwachman has turned to the study of the mineral content of human hair for the diagnosis of a number of diseases, among them cystic fibrosis and lead poisoning. Funds for support of the work of the Division of Clinical Nutrition have come from the National Cystic Fibrosis Research Foundation, the National Institutes of Health, and certain private donors.

7. *Endocrine, Metabolic and Renal Diseases*

The Endocrine Division has a well-integrated program of research, teaching and patient care, which has been built up by Dr. Crigler's tireless efforts since 1955 to provide the best care scientific medicine can offer for patients with endocrine and metabolic diseases. Since the endocrine glands regulate the metabolic activities of the body tissues through the hormones they secrete, the growth of every child is in essence a reflection of the interplay between the rates of secretion of the various hormones, the manner in which they are metabolized, principally in the liver, and the ability of the cells of the end organs to respond to the biochemical

effects of these hormones and their metabolic products. The basic goal of the research program of the Division is to understand human growth in terms of these dynamic biochemical processes by which it is regulated, in order to permit a rational attack upon the diseases of the endocrine system which distort growth and development. This requires an integration of clinical observations, often made over a long period of time, with biochemical and functional tests which require a high degree of sophistication and control. Thus, clinical facilities and laboratories, research and care, are inextricably interwoven and neither can be effective without the other.

Two examples of this interdependence may be cited because they have come to fruition during the past year after long periods of meticulous study.

The first is a study of problems arising from operative attempts to remove craniopharyngiomas. These are essentially benign, but progressively enlarging cystic tumors at the base of the brain, which, by their growth, upset a whole series of regulatory functions which depend on integration of centers in the hypothalamic portion of the brain with the pituitary gland, the secretion from which in turn regulates certain of the other endocrine glands. Complete removal only became possible when the serious functional disturbances, arising both from the destructive action of the tumor and the trauma of its removal, could be successfully managed. Dr. Crigler and his associates worked closely with Dr. Matson over a number of years studying the metabolic disturbances in a series of patients in great detail. Finally, last year, they were able to present detailed instructions for the pre- and post-operative management of these patients to the members of the American Neurosurgical Association, thus opening up the possibility of cure for all victims of this rare but distressing disease.

A second example is a study of an infant which covered a period of nearly two years in the Clinical Research Center. This infant had been constantly jaundiced, because of an inborn lack of a particular enzyme normally involved in the transfer of bile pigment from the blood to the bile as it is formed in the liver. By carefully controlled observations, they were able to demonstrate that administration of a certain drug would induce formation of the missing enzyme and strikingly reduce the degree of jaundice. This is one of the first clearly documented instances in man of induction of the synthesis of an enzyme, parallel observations in a similar case having been made quite independently by an alumnus of our hospital, Dr. Sumner Yaffe, in

Buffala. Partial support for these research activities has come from the National Institutes of Health, the General Research Support Grant of the Hospital and the Wolbach Fund.

The Renal Metabolic Division, headed by Dr. Fellers, has been engaged in several major projects which are important to the future care of patients. First, in collaboration with those in immunology and in pathology, it has been possible to identify a small group of patients with the nephrotic syndrome, in whom the pathologic histology and constantly low level of serum complement identify a different process from that causing the classic type of childhood nephrosis. It is this group, particularly, who have proved unresponsive to present-day treatment. Second, careful studies are being made of the medical management of younger children with chronic renal insufficiency in preparation for kidney transplantation, which we hope our surgical group will soon be prepared to undertake. The procedure has been carried out in a few of our adolescent patients at the Peter Bent Brigham Hospital, but presents a much more difficult problem in children under 12. Dr. Fellers has also been interested in attempting to control the progress of a fatal inborn metabolic error, cystinosis, with a special dietary regimen, and is studying the metabolism of Vitamin D through the use of a radioactive vitamin preparation in children with disturbances of bone mineralization and growth, particularly Vitamin D—resistant rickets. He has trained a group of foreign fellows who are now teaching and doing research in their own countries. Last year he was able to visit former fellows in Korea, India, and Yugoslavia as a Visiting Professor sent by the China Medical Board of New York, and this year he made visits to former fellows in several Latin American countries following the International Congress of Paediatrics in Mexico. His research has been supported in part by the National Institutes of Health, the Charles H. Hood Dairy Foundation, and the Cranberry Growers Association.

A Look Ahead

With great traditions, wise stewardship by its Trustees, generous support from the public, close association with Harvard University, and burgeoning new facilities, The Children's Hospital Medical Center stands in an important position at the start of its second century. How can it meet the responsibilities to the future of pediatrics and child health which this position imposes on it? To answer this question, we must examine the various unmet needs as well as the opportunities which social change and

scientific progress are apt to present to us, decide upon our goals, and set priorities for their achievement.

A. Our Obligation to Children with Unsolved Disease Problems

In speaking to the Opening Session of the XIIth International Paediatric Congress in Mexico in December, 1968, I said, "... we must not forget that every child who becomes ill and requires hospitalization represents a failure of pediatrics. Sometimes this failure may be due to ignorance on the part of the child's family about the nature of disease. At other times, it may be due to lack of an adequate system of health care, a failure whose roots are economic and social. Or it may be due to poor clinical judgment on the part of a doctor or other health worker, who does not recognize the signs of serious illness at its onset; then it is a failure of medical education. Or finally, it may be due to the failure of medical research to determine the cause, and thus to provide the means of prevention or rational therapy, for a particular disease."

Although it must work to minimize all four of these types of failure, a hospital such as ours has a special obligation to foster research upon those diseases for which the means of prevention or cure have not yet been found, because only a university medical center has the combination of clinical facilities, professional staff and research laboratories necessary to do this. In order to do this we must provide the best possible care for such patients, based on present knowledge, which is kept constantly updated. This type of care meets the special needs of the unfortunate victims of fatal, chronic or disabling disease, it teaches the most advanced concepts to physicians who come here for training, and results in the concentration of these patients where their diseases can best be treated and studied.

The real problem is how to bring the rapid advances taking place in the biological and medical sciences most rapidly to bear upon these unsolved problems of disease; how to establish easy communication between the basic scientist, motivated primarily by curiosity about natural phenomena, and the clinical investigator, whose goal is to understand the causes and mechanisms of disease while doing everything possible for the comfort and welfare of his patient. All kinds of arrangements to mingle scientific investigation and medicine have been tried over the years. In general, what seems to work best is close collaboration, based upon mutual respect and the ability to speak one another's language, between clinicians thoroughly trained in science and scientists interested in the challenging

problems presented by disease. It is this pattern which made Dr. Enders' and Dr. Gamble's laboratories so successful in illuminating the problems of disease. As science comes to depend increasingly upon complex expensive and highly sophisticated techniques and instruments, team work becomes more important in medical research. But it will only succeed if clinical investigation is in the hands of scientifically trained physicians who can ask the right questions or seize the unique opportunities presented by an unusual patient or by a newly developed technique, and who have ready access to scientific colleagues, whose knowledge provides the deeper insight required for solution of the problem. For the imagination, insight, critical thinking and flashes of intuition of the "prepared" mind are still the basis of creativity in either basic or applied science.

The new research building going up across Blackfan Street from the Hospital, after many years of waiting and planning, presents us with a magnificent opportunity to put this philosophy into practice. Its success, however, will depend upon the extent to which the clinical scientists who work there keep one foot in the hospital and one in the research building, or the basic scientists maintain close contacts with clinical investigators and other scientists in the building, as well as with professional colleagues in the academic departments of the Medical School and other neighboring institutions. The building was planned to promote just this type of communication, but how it will function will ultimately be determined by the people who enjoy its splendid facilities.

In anticipation of this building, the senior investigators in the Department have been working extremely hard with their colleagues in other departments to plan for the most effective use of space and for the financing of the research programs to be housed there. The opportunities for joint use of major equipment and for collaboration between members of different clinical departments and basic scientists with common interests should add a wholly new dimension to the research potentialities of this institution. With a large amount of space in prospect, each of the research groups has begun actively recruiting new personnel to strengthen their programs.

Certain new directions of research are bound to be encouraged in an environment designed to promote interdisciplinary scientific collaboration — for example, the study of drug action in children by the fusion of work in developmental biochemistry with studies in clinical pharmacology; collaborative

morphological, biochemical and clinical research upon diseases of the skeletal system; or, the application of genetics, biochemistry and immunology to the basic problem of allergy or the challenging field of transplantation of cells or organs, which is such an appropriate approach to the treatment of children with congenital malformations. Limitations of space and the scattering of laboratories all over the institution has discouraged this sort of interdisciplinary team work in the past.

B. *Our Obligations as a Teaching Institution*

Research and teaching go hand in hand. By teaching, an institution multiplies the impact of its work, since its students carry its ideals and the knowledge they acquired in it to other places where they in turn may become teachers or practitioners whose patients are the ultimate beneficiaries of our educational program. Education has always been an integral part of the life of the Children's Hospital, and must continue to be. Certain principles ought to dominate the teaching program in the future as they have in the past, namely:

1. Teaching, above all, must be by example, in which devotion to the patient's welfare takes precedence over all else.
2. The emphasis should be upon learning by the assumption of responsibility, appropriate to the level of knowledge and judgment of the student. This has been the traditional method used in the training of physicians and nurses. It has become fashionable to decry this type of "apprenticeship" training in favor of more "academic" programs, but there is no substitute for this type of experience in medical education.
3. The organized teaching program, needed to supplement this apprenticeship experience, must emphasize the solving of problems rather than learning by rote. The essence of education is to learn habits of thinking that will be applicable to new problems in the future, rather than to memorize solutions to past ones. This is why the research atmosphere is so important to the teaching program, since each patient presents a new problem.
4. The educational program must be relevant to the student's previous educational experience and to his intended future career. Just as the curricula in our medical schools are now being adapted to the stronger educational foundations of the entering students and to their need to prepare for a

wider diversity of medical careers, so we must adjust our graduate training programs to the changing character of the interns, residents and fellows who come for training and to the variety of careers now open to pediatricians. Like the medical school, we probably must have a *core program* for all, with an increasing number of choices open as the student progresses through a training period of several years, with the greatest diversity of choice in the final years.

To maintain our relevance as a teaching institution, we must have a concern for the health needs of the community, although obviously we cannot meet them all. The present Medical Emergency Clinic provides a tremendous volume of service to the children of the City, but this is stop-gap, fragmented, episodic care for a single illness, rather than a comprehensive program of continuing health protection such as a family pediatrician provides for his patients. What pattern of care will most effectively provide for the health needs of the urban poor? At present, government funds are being used to establish costly programs of care patterned on what has worked so well for middle-class patients, but these programs are having to deal with a culturally different population, and there simply are not enough doctors available to meet the care needs of both groups, since most pediatric physicians are already overworked. Consequently, we need to approach the problems of health care as we would any other problem — by analysis, experimentation and evaluation. In other words, we need research on health care, and we must take its problems to the laboratory.

But where is the laboratory? Fortunately, it is already here, since one purpose in organizing the Family Health Care Program in 1955 was to provide a laboratory for the study of health problems in the community as opposed to the hospital. Now, a group of additional field laboratories are becoming available, because, under the stimulus of Dean Ebert, who shares this philosophy, the Harvard Medical School is organizing a prepaid comprehensive care plan for a defined population of subscribers. In addition, the Martha Eliot Family Health Center and the proposed health care facilities of the new Model Cities Program provide other opportunities for studying medical care in the community. Research is already being organized by the new Harvard Center for Research in Medical Care, under the direction of Dr. Paul Densen; this tends to look primarily at the operational successes of various schemes of care. It is essential that we look

more deeply into the extent to which one or another pattern of health care affects the family's health habits, use of medical facilities and ultimate health. In other words, we must evaluate in qualitative as well as in quantitative terms. We feel that the Medical Care Research Unit of the Family Health Care Program should become an essential component of our hospital so that well thought out plans for evaluation are built into every functional change in the Hospital's care programs, so that we are constantly evaluating the extent to which new developments both within the hospital and in its community health care program are actually achieving the goals for which they were established.

Since the shortage of physicians to deliver health services is a reality now, and the fearfully expensive projected increases in doctor output by creation of new medical schools will take a long time to produce more physicians, there is a desperate need to find ways of increasing the quantitative effectiveness of each physician. Experimentation in the use of ancillary personnel, who can be trained at less expense, so as to double or triple the number of patients a physician can care for, is an urgent necessity. Therefore, in our field laboratories, with careful planning for evaluation by the Medical Care Research Unit, we should initiate a whole series of experiments in using psychologists, social workers, and nurse physician assistants to take over many of the doctor's present more routine duties, in training practical nurses aides to supplement the nurse's skills, as well as stable lay people, such as young grandmothers or the equivalent of the corpsmen used in the Armed Forces, to work in the health team. Such a plan has a twofold advantage. First, it will permit the physician to devote more time to the diagnosis and treatment of disease for which he has been trained, while it will provide dignified and satisfying work for many people who have no jobs today. But it must be tried out in such a way that it can be evaluated, and the training program must be allowed to evolve until a successful pattern is achieved. This requires the research-oriented environment of a university medical center.

Finally, we must equip physicians to cope with the medicine of the future and not simply the medicine of the present or the past. We now offer unexcelled training in the recognition and management of serious, life-threatening disease. This is essential for every physician, for no other member of the health team has comparable responsibility or capacity for saving lives. Thus, the development of this capacity must be part of the "core training" for every doctor. His ability to recognize serious ill-

ness and to deal effectively with it is based on clinical experience and judgment, built upon an understanding of basic medical science. But in the care of patients in the community, opportunities for saving lives are rare, though vitally important. Many of the problems for which patients seek medical help have a psychological basis. As in our outpatient department, children are often brought to the doctor because they fail to meet their parents' expectations in growth, development, academic or athletic achievement or because they develop symptoms out of proportion to the clinical evidence of disease. Just as the basic medical sciences are an essential foundation for the diagnosis and treatment of organic disease, knowledge of the behavioral sciences is required if the physician is to meet his patients' needs for support in the areas of emotion, behavior and social adaptation. This aspect of medical and premedical education has been severely neglected over the years. It must be strongly represented in the education of pediatricians. Therefore, we must build scientific strength in the behavioral sciences into the pediatric department of the future. This can best be done by encouraging research upon child development and parent-child interactions within the institution. To do this, I believe that a Center for the Study of Child Development, based at The Children's Hospital Medical Center, should be created. Such a Center could tap the resources of the entire University, for example, those from the Center for Cognitive Studies of the Department of Social Relations and from the School of Education, at Cambridge as well as representatives of the fields of genetics, psychology, child psychiatry, neurology and pediatrics in our own institution. Although the general concept of such a Center is implicit in the plans for the four floors of the new research building dedicated to mental retardation research, a framework is needed which will link these research activities more closely with clinical teaching and research in the hospital and with study and teaching in the fields of education and learning in Harvard College.

C. Goals and Resources

In looking ahead, we have taken the following as our basic goals:

1. Research, in three broad areas:
 - a) the causes and mechanisms of disease, for which, as yet, neither means of prevention nor cure have been found;
 - b) the delivery and quality of health and medical care, with particular reference to our cities;
 - c) the psychological development, learning and adaptation of children to society;

2. Teaching, in order to multiply the impact of this institution upon child health problems.

None of the above goals can be achieved without providing health and medical care of the highest possible quality. However, there are many specific questions about how these goals are to be achieved.

There is no magic formula, except to maintain the highest quality of staff at all levels. This is a matter of creating conditions which attract good people to the institution and of using a method of selection which is most likely to insure wise choices for important staff positions. The ability to attract good people depends to a large extent upon the opportunities they foresee for satisfaction — a Center to which patients come from a wide area seeking help, thus providing abundant clinical material, good facilities, adequate support and sufficient time for scholarly pursuits, and those intangible attributes which make any institution a happy and exciting place in which to work and which give everyone there a sense of being swept up in forward movement. This sense pervades The Children's Hospital Medical Center at the moment, and must be preserved. The selection process depends upon human wisdom and judgment, both always frail, but it is guaranteed best in the long run by the Hospital's intimate association with Harvard University and the latter's dominant role in the choice of the institutions's key leaders. However, selection is equally important at junior levels, and here the key is the ability of the institution to attract the best young people from all over the world into its training programs, for it is from these that the majority of our junior full-time staff, who are its most productive members, will be drawn.

Important as the members of the voluntary and part-time staff are to the service and teaching functions of the Hospital, it is the full-time staff which sets its tone because they are responsible for the research which keeps the Hospital constantly moving forward. To have a full-time staff costs money in salaries and support for their work, so we are driven back to a consideration of financial resources. As a private institution, The Children's Hospital Medical Center is fortunate in the size of its endowment, but these funds are not unlimited, and the time may well come when choices must be made in their use.

Fifty years ago the major function of the Hospital was service in an era when almost all health and welfare programs were supported by private charity. Since then the obligation of government to meet the basic needs of the population in the fields of health, education and welfare has been generally

recognized, but has not been fully achieved, so we are still in a period when the needs for service out-run the capacity of governmental programs to pay for them. For the 23 years that I have been Physician-in-Chief, I have been predicting that it would not be long before governmental support in one form or another would fully meet our costs of medical care, thus abolishing the Hospital's operating deficit and permitting us to devote income from endowment almost entirely to the support of the full-time staff. When Medicaid became law, it looked as though that long-awaited time had at last arrived, but as the financial report shows, the deficit is, if anything, larger than ever.

If the government does not use its taxing power to pay fully for medical care for the indigent, it may become necessary to curtail our services, and to budget only a specific amount for free services to patients. If this unhappy day does come, we must first make sure that the free services we do give go to those children whose medical needs are greatest and for whom our institution has something unique to offer, and, second, use all our powers of persuasion to see that the needs of all children for care are kept constantly in the public eye and before the government.

In any case, as a private institution, with limited resources, we have a primary responsibility to use our own funds to train leaders in pediatric teaching, research and practice, to promote research and to test innovative programs of care, which will provide examples of what can and should be done by the governmentally supported service programs of the future. At the same time, we must do everything in our power to utilize additional funds which may be obtained from all outside sources to support our professional programs, so as to make the hard money income derived from the endowment of the Harvard Medical School and The Children's Hospital Medical Center go as far as possible in guaranteeing competitive salaries and secure positions for the key members of the full-time staff. As the Chief of one of our key divisions put it, "This division cannot remain strong — without stability at the top. The young men in training in such a full-time academic group must feel that the Chief of the division has his eye upon them and not upon his next job. They must feel that the Chief has as his main purpose their own development and they cannot be forced to suspect that they are merely

stepping stones for another person's career." The Hospital has developed a number of outstanding groups as a result of the historical development of specialization here, and secure, stable positions must be created for their Chiefs, as they have been for the Chiefs of the major departments in the past. This will require a commitment on the part of the Trustees to devote income from endowment to guaranteeing salaries, many of which can be funded from outside sources in part, but must be underwritten by the institution if academic tenure is to be achieved for those who have earned it.

The staff and administration have made tremendous efforts to increase legitimate income from outside sources. Research and training grants from the National Institutes of Health, other government agencies, and private foundations are only obtained by blood, sweat and tears on the part of those who make the applications. Such grants still make up the major sources of support for this department. The swing in federal funds away from support for medical research to greater support for programs of service and for demonstration projects is helping us to meet the costs of some service programs. Finally, the income from professional services rendered to those insured by Blue Shield and commercial insurance schemes as well as the potential income for professional services to the medically indigent under Medicaid, if the latter is ever adequately administered and funded in Massachusetts, and income from postgraduate courses, all represent funds earned by the staff in their work, which are being collected and used to support the staff as fairly and effectively as possible.

This is a period of rapid change, when the financing of private institutions faces many problems, as governmental policies shift with political changes, and inflation keeps gnawing away at the value of the dollar. But, if we can keep our sights clearly focused on our basic goals, maintain the high quality of our staff, and give its key members secure positions which will permit them to devote full-time to their research, teaching and specialized expert care for sick children, there is no question but that The Children's Hospital Medical Center will provide the same sort of pioneering leadership in its second century as it has in the past. And ultimately it may achieve the goal that Mr. Farley set for it 25 years ago — to transform the Children's Medical Center into the Children's Health Center.

Table I
Ambulatory Services

**No. of Services
to Medical Clinics**

	<i>1946-47</i>	<i>1956-57</i>	<i>1965-65</i>	<i>1965-66</i>	<i>1966-67</i>	<i>1967-68</i>
Child Health Division	—	2,839	4,305	4,445	4,308	4,099
General Medical OPD	13,470	7,701	7,379	6,755	5,677	5,569
Adolescents' Unit	—	4,807	7,385	7,264	7,801	7,263
Special Medical Clinics	10,890	10,057	14,643*	14,333*	15,285*	17,598*
Emergency Clinic†	—	5,506	34,314†	38,347†	41,631†	43,026†
TOTAL VISITS (Med.)	24,360	30,910	68,026*	71,154*	74,702*	77,555*
TOTAL VISITS (Whole Hospital)			139,828	149,098	154,697	173,715
% MEDICAL			48%	48%	48.5%	45%

*These figures include Rheumatic Fever Clinic and exclude figures for Neurology and Seizure Clinics, since Neurology Department was established in 1963.

†These figures include totals for Medical Emergency Clinic, operated separately from 8 a.m. to 11 p.m. and $\frac{2}{3}$ of figures for General Emergency Clinic, which operates as a combined Medical-Surgical Clinic from 11 p.m. to 8 a.m.

Table II
In-Patient Services
Dept. of Medicine

	<i>1946-47</i>	<i>1956-57</i>	<i>1965-65</i>	<i>1965-66</i>	<i>1966-67</i>	<i>1967-68</i>
Short-Term Divisions						
Admissions	2,261	2,917	3,685	3,528	3,527	3,594
Hospital Days	33,926	26,484	31,556	34,920	35,315	35,080
Average Stay (Days)	15	8.4	8.0	10.1	10	9.8
Long-Term Divisions						
Admissions	464	253	222	150	146	186
Hospital Days	32,692	20,757	6,218	6,920	6,801	6,821
Average Stay (Days)	70	82	19.6	28.2	47	37
TOTAL MEDICAL ADMISSIONS	2,725	3,007	3,907	3,678	3,673	3,780
TOTAL HOSPITAL DAYS	66,618	47,247	38,320	41,840	42,116	41,901

Table III

Mortality

Comparative Figures (Past Five Years)

<i>Year</i>	<i>1963-64</i>	<i>1965-66</i>	<i>1966-67</i>	<i>1967-68</i>
Admissions	3,888	3,678	3,673	3,780
Deaths	249	243	211	228
Mortality	6.4%	6.6%	5.8%	6.1%
Postmortem Exams.	87%	85%	89%	85%
Major Causes of Death				
1. Neoplastic Diseases	33%	24%	39%	39%
2. Heart Disease	21%	18%	20%	21%
3. Other				
Congenital Malformations	13%	14%	15%	19%
(including inborn errors of metabolism)				
4. Infection	4%	10%	13%	12%
5. Diseases of Newborn	14%	7%	9%	11%
(including prematurity)				
6. Kidney Disease	2%	3%	2%	3%
7. Miscellaneous and Unknown	13%	24%	17%	13%

DEPARTMENT OF NEUROLOGY

Charles F. Barlow, M.D.

Although there was part-time neurologic consultation at Children's Hospital prior to 1920, the real beginning of neurology at this institution coincides with the appointment of Dr. Bronson Crothers as "Neurologist of the Hospital". This took place at 6:00 P.M., October 1, 1920, at a meeting of the Visiting Staff of Children's Hospital, at the Harvard Club. The appointment initiated the career of a pioneer in the field of child neurology, and established this institution as a respected leader in the field.

Dr. Crothers began his medical studies at Harvard, and continued his preparation at the Massachusetts General Hospital and the Children's Hospital. After a period of service in both the British and American armies in World War I, and a trial of private practice, he turned his attention to the nervous system. His appointment at Children's followed a period of study at the Neurological Institute in New York, and in the laboratory of Dr. Walter Cannon under the guidance of Dr. Stanley Cobb. (He became Clinical Professor of Pediatrics in 1945, and retired to Emeritus status in 1952.)

Dr. Crothers first addressed himself to the understanding of obstetric injuries of the nervous system. He was vigorous and effective in calling attention to the hazards of breech delivery, with such profound effect that the ensuing years have seen a significant reduction in brachial plexus and spinal cord injuries on the neurological division. He then turned his attention to improving and sharpening diagnostic appraisal of intellectual and psychologic deficits in children. This interest initiated a long term collaboration with a series of discerning psychologists, a meaningful collaboration which was continued to the present day. Dr. Elizabeth Lord was the first occupant of the new psychology examining suite, replete with what is now probably one of the oldest see-through mirrors in continuous use in this country. She was succeeded by Dr. Edith Meyer Taylor. Both individuals have recorded their experience in excellent monographs. The tradition of psychology in collaborative juxtaposition to neurology is now carried on with sophistication and dedication by Dr. Amelia Blackwell and her associates. The close working collaboration of the two disciplines has stood the test of time and has served as a model for similar developments elsewhere.

It is difficult to be concise about a career as productive as Dr. Crother's. Certainly his lifetime of study of patients with cerebral palsy must be mentioned, a study which he finally found time to complete after his retirement. His book, coauthored by Dr. Richmond S. Paine, *The Natural History of*

Cerebral Palsy, is a classic. It sets forth his abiding concern about the eventual personality development and adjustment of the handicapped individual as an adult, a concern which took precedence over details of motor function, articulation, and performance on standard tests of intellectual function.

Dr. Crothers was a teacher who had an impact on several generations of house officers at Children's Hospital Medical Center, certainly including the author of this account. Among those who must be mentioned in that they have carried a special mark of his influence, are Dr. Randolph K. Byers, Dr. William Berenberg, Dr. Peter Tizzard, and Dr. Richmond S. Paine.

Randolph K. Byers, M.D.

Dr. Randolph K. Byers assumed the responsibility of the Neurological Service upon Dr. Crother's retirement in 1952. It is the good fortune of all of us that he remains as active as before, despite the incidental formalities of "retirement" on two separate occasions and election to Emeritus status at the Medical School. Without elaborating on his almost pure Harvard and Children's Hospital training, the important dimension of his background which had a significant effect on neurology at The Children's Hospital Medical Center was his wide experience in the more general aspects of pediatrics. Although he was closely associated with Dr. Crothers and the Neurological Service for most of his professional lifetime, it was not until 1952 that he restricted himself to neurologic diseases. During his tenure the tradition of interest in the management and diagnostic judgment of handicap in the problems of mental retardation and cerebral motor defect continued. In addition Dr. Byers broadened the concern of the division to include a wider spectrum of neurologic disease.

He has made a continuing contribution to the subject of lead intoxication, beginning with a study of the consequences of mild encephalopathy on intellectual performance. He has been a major contributor to the subject of treatment of acute encephalopathy with calcium versenate, and has several publications illustrating a concern for early diagnosis, which culminated in a recent publication with Mr. Louis Kopito and Dr. Harry Schwachmann on a simple rapid method of determining the lead content of hair by atomic absorption spectroscopy. This development has greatly facilitated the important public health measure of searching out children who are vulnerable to acute brain damaging intoxication. Again, it is difficult to be selective among a wide range of studies, but

his clinical reports on disorders of the motor unit stand out. His interest began with disease of the anterior horn cell of the spinal cord, encompassed the poorly understood chronic peripheral neuropathies of childhood, and included a series of publications on muscle disease.

During Dr. Byer's responsibility for the neurological service, the National Institute of Health-sponsored Training Programs in Child Neurology were begun. The need for training of qualified people in the rapidly expanding subspecialty of child neurology was recognized by The Children's Hospital Medical Center. A formal, one-year program was offered beginning in 1958, and between that date and 1963 a number of individuals had the pleasure of a concentrated neurological experience under his tutelage. Most have gone on to positions of academic responsibility in this country and elsewhere in the world.

William Lennox, M.D., and the Seizure Unit

Dr. Lennox came to the Children's Hospital in 1944, already having had a productive career and established reputation in the field of epilepsy, based primarily on work at the Neurological Unit at the Boston City Hospital. His chief early work centered about determination of arteriovenous differences in blood constituents in normal individuals, and in people before and after seizures. This led to the development of appropriate instrumentation to determine cerebral blood flow, and application of these techniques to the study of seizures. His most enduring contribution, however, was the application of the electroencephalogram to the study of convulsive disorders. He, in collaboration with Drs. Fred and Erna Gibbs, made a series of exceptional observations which today form the cornerstone of clinical electroencephalography. His interests extended to drug therapy and he introduced the first truly useful drug for petit mal, trimethadione, in 1945, shortly after he came to The Children's Hospital Medical Center. In addition to his scientific accomplishments, he must also be recognized as a pioneer in the multidisciplinary care of an individual with a chronic disability. His special interest and accomplishment at Children's Hospital Medical Center was to establish such a specialized facility for seizure problems, the Seizure Unit. A number of physicians from over the world received specialized training in the unit, among whom Doctors Douglas Davidson, Gordon Millichap, and Cesare Lombroso should be mentioned.

Dr. Lombroso has guided the affairs of the Seizure Unit since Dr. Lennox's retirement. He has had the

additional responsibility of the Division of Clinical Neurophysiology of the hospital, which includes responsibility for routine electroencephalography, echo encephalography, as well as special procedures. These activities became an integral part of the Department of Neurology when it was established in 1962. The traditional base for EEG and Seizure Unit activities on the second floor of the Carnegie Building was vacated, and the Clinical Neurophysiology Laboratories and Seizure Unit offices occupied newly remodelled quarters on the second floor of the Administration Building early in 1969.

The Bronson Crothers Professorship of Neurology

The endowment upon which the Crothers Professorship is based was the generous gift of an anonymous donor. The gift called attention to the major role of neurologic disease in the pediatrics of today. It was the crucial step required to move the discipline forward at this time, establishing the financial base for departmental status at the Harvard Medical School, and providing funds to free the incumbent from the need to derive his total support from the practice of medicine. This set the stage for an expansion of training. Additionally, it made possible the development of a laboratory and clinical research potential which was not possible before.

Dr. T. Lahut Uzman was the first incumbent of the position in 1962. His very productive scientific career was cut short after less than one year tenure in the Professorship. He had made major contributions to the understanding of biochemical issues underlying neurologic disease, making enduring contributions to the chemical pathology of Wilson's disease, Gaucher's disease, as well as fundamental contributions on the subject of myelination and cell migration within the nervous system. These contributions were made primarily during his association with the Boston City Hospital, and his brief career at Children's was limited to organization rearrangements of the clinical service and setting up his research laboratory. Children's and Neurology could ill afford the loss of this brilliant investigator.

A five year period has elapsed since I was given the opportunity to carry on the tradition in neurology established by my predecessors. The groundwork of clinical and training excellence was established by Drs. Crothers and Byers, and the need for a basic laboratory approach and expended training program was enunciated by Dr. Uzman.

Patient Care

The basic inpatient facilities have remained much the same, although utilization has increased considerably, principally due to the increase in staff. In addition, remodelling of Bader 4 and 5 permitted more effective use of the space, particularly with regard to care for more acute problems. It is apparent now, however, that the facility designed by Dr. Crothers 40 years ago no longer adequately fulfills the needs of neurology today, and that our current patients are among the least effectively housed in the hospital. This need should be satisfied when the proposed inpatient services building is available. On the other hand, the Fegan Memorial Outpatient Center has had a most favorable impact on the opportunities for long term ambulatory care of neurological patients. The major problems with which we deal are mental retardation, seizure disorders, and cerebral palsy, as well as a host of less common neurological problems.

Training

The postgraduate neurological residency program has undergone considerable expansion over the period from 1963 to the present. Full recognition of our combined program with the Peter Bent Brigham Hospital was awarded by the American Board of Neurology and Psychiatry, in 1963. In 1967 the newly formed neurological service at the Beth Israel Hospital was added. Sponsored by a National Institutes of Health Training Grant to the Harvard Medical School, these three Harvard teaching hospitals now offer a full program of training leading to certification in neurology. For our trainees with the required pediatric background, the Board will now recognize "special competence in pediatric neurology" on the certificate.

Perhaps this is the time to report that my own certificate has been revised in this fashion, fortunately under a "grandfather" provision. There were some personal reservations about grandfather status, but I am pleased to note that my certificate is recorded as Number 1 due to the fact that I outrank my fellow grandfathers alphabetically. The combined program has 12 residents in training (four in each of three years). In addition to clinical experience at Children's and the adult hospitals, our trainees have specialized periods of training in electroencephalography and clinical neurophysiology with Dr. Lombroso, neuropathology with Dr. Floyd Gilles, as well as research training opportunities. The training program also accepts the responsibility for fellowship level experience in laboratory research, seizure disorders (Dr. Lom-

broso), and cerebral palsy (with Dr. Berenberg and the Cerebral Palsy Clinic), as well as rotating house officers from the Pediatric Service, and Harvard Medical students. Inasmuch as our overall objective is to produce academically oriented neurologists, we are pleased that our alumni roster from all aspects of the training program includes two associate professors and at least five assistant professors in other schools in the period since 1963.

Research

The important task of recording and reporting clinical observations in our patients has continued as before. Several recent and continuing programs of patient study warrant special mention. Dr. Gordon Watters, in collaboration with the Tumor Therapy and Neurosurgical Service, is responsible for a program of ventriculolumbar perfusion of chemotherapeutic agents for the treatment of brain tumor and a variety of chronic encephalitis. The direct instillation of drugs into the ventricular and cerebrospinal fluids in this fashion is necessary because these agents do not generally reach brain in adequate quantity when administered by other means. This therapeutic program has also permitted a definitive study of the movement of proteins into the cerebral fluids and has led to adaptation of specific methods to measure formation and absorption of fluid in the patient. This latter information is of basic relevance to the problem of hydrocephalus, an important cause of neurological defects in children. A study of hydrocephalic patients has now begun in collaboration with the Neurosurgical Service, in an effort to improve our methods of assessment and treatment of this condition.

Another long term project is the study of muscle disease in children, involving collaboration with orthopedic and pathology departments. In addition to a thorough clinical assessment of the patient (Drs. Watters and Pappas), muscle tissue removed for diagnostic biopsy is studied biochemically (Dr. David Dawson), histochemically and ultrastructurally (Dr. Floyd Gilles).

The Neurology Research Laboratory, under Dr. Antonio Lorenzo's direction, lends close scientific support to the human investigations. The primary areas of additional interest of this laboratory include continuing studies of regional permeability change in experimental seizures and basic studies of the transport of chemical substances into and out of brain and cerebrospinal fluid. Amino acids are the object of most intensive current study. Dr. Robert W. P. Cutler, who made a most effective contribution to the clinical and laboratory research

programs, first as research fellow and then as staff, resigned to assume an associate professorship at the University of Chicago in September, 1968. Dr. Helen Cserr, Instructor in Physiology, joined us at that time to pursue her interests in the ontogeny and phylogeny of cerebral fluids.

The electroencephalographic technique of computer averaged evoked potentials combined with further computation and vector analysis in collaboration with the Harvard Computing Center has proved to be a most useful research methodology. Dr. Lombroso and associates in the Division of Clinical Neurophysiology have made important contributions to the methodology and have examined such problems as visual suppression during eye movements, amblyopia exanopsia, color vision and certain varieties of seizures. Dr. Robb, of Ophthalmology, has been an important collaborator in some phases of this work. Plans are well along to examine this aspect of the neurophysiology of the newborn and premature infant, a study to be combined with the psychophysiological studies of Dr. Wolff. A neurophysiology laboratory is now being established to investigate electroneurophysiological issues at a more fundamental level in animals.

Residents and fellows in training have been incorporated into the research programs wherever possible. For example, Drs. Hammerstad and Snodgrass made significant contributions to the cerebrospinal fluid studies, while Dr. Frank Duffy and Klaus Herberg have played major roles in the evoked potential studies.

Plans for the Future

My retrospective task in this 100th year is simpler than some of my colleagues' inasmuch as Neurology only has a 49 year history in this institution, and during only about six years of this time has it operated as a full department in the hospital and the school. However, a degree of pride of past accomplishment is exceeded by our excitement about the future. We must begin by consolidating some aspects of our rapid recent growth with respect to training and ambulatory service. Any major change in inpatient service must await new facilities. This much needed development is probably three to five years away. Our biggest task of the immediate future is the proper utilization of the research facilities which will be provided by the Mental Retardation Research Program in the New Pediatric Sciences Building. The planning to date for this structure has required appreciable investment of time and funds. Interim research space and personnel are being actively developed so that occupancy can proceed in an orderly fashion.

Mental Retardation and Human Development Research Program

It is appropriate that the Centennial issue of the annual report contain the first report of the current status of the Mental Retardation Research Program. Mental Retardation is one of the most frequent chronic symptomatic disorders with which we deal, and disorders of mentation, communication, and behavior are symptoms of a great variety of intrinsic disorders of the nervous systems as well as general systemic disorders, with a liberal implication of environmental issues.

In recognition of the magnitude of this problem in present day pediatrics, together with a history of commitment to the problem by many past and present members of the staff, the Trustees gave the green light to the formulation and execution of a major, coordinated hospital program to investigate causes, prevention and treatment of mental retardation and related aspects of human development.

The first phase, begun about five years ago, was to survey resources of The Children's Hospital Medical Center to determine the most appropriate areas of investigation for us to emphasize. We recognized that a remarkably wide spectrum of research effort could apply to this problem, but we chose to include three major, overlapping programs of investigation. Each would evolve a program beginning with basic research and culminate with direct patient related investigation. The program areas chosen were: (a) Neuroscience, including the special sensory systems, (b) Behavior Science, and (c) Genetics and systemic metabolism. Interdisciplinary collaboration would be encouraged and facilitated. Finally, the efforts related to mental retardation should be closely interrelated with hospital research programs in other areas. The personnel of the Mental Retardation program currently includes members of the hospital departments of Pediatrics, Psychiatry, Neurology, Neurosurgery, Pathology, Radiology and Surgery (Ophthalmology), as well as full time investigators affiliated with the Harvard Medical School Departments of Pharmacology and Physiology.

This research program was presented to the National Institutes of Health, and was a successful competitor for a construction grant award in the amount of \$2,470,000 to build a five-floor unit together with appropriate supporting facilities. The success of the REACH program assured the matching money. The subsequent award of government funds to complete an additional increment of general research space accounts for the current build-

ing activity at the corner of Longwood and Blackfan. Construction is proceeding on schedule, and we expect to occupy the structure in 1970.

In the meantime, we have begun an interim implementation and orderly expansion of the research programs. To this end we have requested implementation funds for certain core aspects of the overall program. This request was approved by the National Institute of Child Health Council in the amount of \$1,036,000 over a five year period, beginning September 1, 1968.

The program presents an exciting opportunity for Children's Hospital Medical Center to move forward in our understanding of this important problem. The roster of investigators in the program fellows, but does not include the full listing of participating House Staff, Fellow, technicians and secretaries, without whom the program could not go forward.

Barlow, Charles F., M.D., Neurology
Program Director
Gerald, Park S., M.D., Pediatrics
Co-program Director — Genetics and Metabolism
Wolff, Peter H., M.D., Psychiatry
Co-program Director — Behavioral Science
Lorenzo, Antonio V., Ph.D., Neurology, Pharmacology
Associate Program Director Neuroscience
Bashir, Anthony S., Ph.D., Speech, Investigator
Berson, Eliot, M.D., Ophthalmology, Investigator
Bloom, Gerald, M.D., Pediatrics, Investigator
Chaves, John, Ph.D., Psychology, Audiology, Investigator
Crocker, Allen C., M.D., Pediatrics, Investigator
Cserr, Helen F., Ph.D., Neurology, Physiology, Investigator
Cushna, Bruce, Ph.D., Psychology, Investigator
Dawson, David M., M.D., Neurology, Investigator
Gilles, Floyd H., M.D., Neuropathology, Investigator
Goodman, Allan C., Ph.D., Audiology, Investigator
Hausman-Hagemeijer, Anne-Marie, M.D., Pediatrics, Investigator
Hedley-Whyte, E. Tessa, M.D., Neuropathology, Investigator
Hurwitz, Irving, Ph.D., Psychology, Investigator
Kang, Ellen S., M.D., Pediatrics, Investigator
Lombroso, Cesare T., M.D., Neurology, Investigator
Robb, Richard M., M.D., Ophthalmology, Investigator
Schnell, Richard R., Ph.D., Psychology, Investigator
Sweetzer, Richard S., M.A., Audiology, Investigator
Tefft, Melvin, M.D., Radiology, Investigator
Walzer, Stanley, M.D., Psychiatry, Investigator
Watters, Gordon V., M.D., Neurology, Investigator

Department of Neurology Statistics

1967-1968

Outpatient

Neurology (including Seizure)	2,086 new
	3,959 Total visits

Inpatient

Patient days	4,550
	Percent occupancy 90.3
Admissions	568

Division of Clinical Neurophysiology

EEG	4,219
Sonar scans	747
Special procedures	172

Residents and Fellows

(Completed program 1967 or 1968)

Dr. Frank H. Duffy	1966-1968 (1969)
Dr. Anibal T. Garcia	1965-1968
Dr. Generoso G. Gascon	1965-1968
Dr. John P. Hammerstad	1965-1968
Dr. William Olson	1965-1967
Dr. Giuseppe Erba, Fellow, Seizure Unit	1965-1967
Rowena Korobkin, Fellow (Research)	1967-1968
Dr. J. I. Manson Fellow, Seizure Unit	1966-1967
Dr. Neil Morris Fellow, Seizure Unit	1967-1968
Dr. Roger Robinson Fellow (Research)	1966-1967
Dr. Ikuko Shirahige Fellow (Research)	1967-1968

Residents — Current

Dr. Israel F. Abroms	1966-present (1969)
Dr. Michael Bresnan	1966-present (1969)
Dr. Rebecca Hanson	1965-present (1969)
Dr. Alexander Spence	1966-present (1969)
Dr. David Van Dyke	1968-present (1969)
Dr. Lisa Yessayan	1967-present (1969)
Dr. Klaus-Peter Herberg	1966-present (1969)
Dr. Joel Richmon	1967-present (1969)
Dr. S. Robert Snodgrass	1967-present (1970)
Dr. W. Stroud Connor	1968-present (1971)
Dr. Robert Cullen	1968-present (1971)
Dr. Hilton Fowler	1968-present (1971)
Dr. Kenneth Nakano	1968-present (1971)

Seizure Unit Fellows (Current)

Dr. Rugero Corazzo	1968-present
Dr. Surendra Kaul	1968-present
Dr. Taranath Shetty	1968-present
Dr. Patricia Sonksen	1967-present
Dr. Takeo Yogo	1966-present

DEPARTMENT OF NEUROSURGERY

Donald B. Matson, M.D.

The Field of Pediatric Neurosurgery

The neurosurgeon deals with problems of the nervous system which are amenable to surgery; the brain and spinal cord and their bony coverings, and peripheral nerves. In children these surgical problems include not only those conditions to which the adult is susceptible, such as skull fracture, broken neck, divided nerves; tumors, "strokes", and infections, but also those abnormalities caused by defects present at birth which may predispose a child to trouble either immediately or with growth. One of these conditions is hydrocephalus, the inability to circulate and absorb spinal fluid, with the production of an accumulation of fluid inside hollow channels with the brain, enlargement of the head, and ultimate brain damage. Another, myelomeningocele, is the presence of exposed spinal cord in the low back, with paralysis of some or all of the leg muscles. The normal separate skull bones may be fused together before birth, causing restriction or distortion of the growing brain, a condition known as craniosynostosis. Some of the effects of these conditions can be controlled by timely surgery and continued attention during the period of active growth.

The pressure on an infant's head during the process of birth itself may produce bleeding within the skull; detection and removal of these collections of blood is essential for normal brain growth. Certain spinal cord tumors, peculiar to childhood, present special problems in orthopedic and urological rehabilitation because nerves innervating muscles or bladder are damaged. Since the base of the brain, the hypothalamus, plays a most important role in the coordination and regulation of the body's hormones by controlling the pituitary gland, surgery for tumors in this area or control of bodily function following head injuries which damage this area, cannot succeed without the expert knowledge of endocrinological function. Thus the pediatric neurosurgeon contends not only with the injured child, or the child suffering from an incurable malignancy, but must repair, if he can, some of nature's errors; carry out prophylactic operations on apparently normal children with progressive, potentially crippling conditions; and working closely with colleagues in neurology, pediatric medicine, orthopedics, and surgery, tackle the challenging problems of operating in the regions of the brain which control life itself, and in the rehabilitation of children who have lost some of their faculties because of nervous system damage.

A great proportion of our work is the diagnosis and treatment of brain tumors; well over 750 chil-

dren with brain tumors have been operated upon at this hospital. Of these, 53 percent were benign. In certain of these benign tumors, which occur in the cerebellum, the part of the brain controlling coordination, surgery can provide cure in 90 percent of cases. Of over 115 tumors of the spinal canal, 57 percent were benign.

This is a challenging and fascinating field; it attracts interested and capable men; it is work well rewarded by the innocent faith of the patients, by their uncanny resilience and ability to get well, by their parents' understanding and gratitude, and by the great variety of conditions which can be corrected.

History of the Neurosurgical Service

The Neurosurgical Department at The Children's Hospital Medical Center got its start in 1929, when Dr. Franc D. Ingraham, then 31 years of age, returned from Oxford, England, to the Peter Bent Brigham Hospital, and, working closely with Dr. Harvey Cushing, began working on the problems of pediatric neurosurgery.

Dr. Ingraham had gone directly to the Brigham on graduation from Harvard Medical School in 1925, and there spent a year as surgical house officer under Dr. Cushing, following which he spent a year at Johns Hopkins University as a Fellow in Surgery under Dr. Walter Dandy. During his second Brigham year as assistant resident in 1927, it is interesting to note that the house officers, as the Brigham still calls its internes, included Cobb Pilcher, William German, Trygve Gundersen, Cameron Haight, Joseph Barr, Richard Meagher, and other names now so familiar not only to neurosurgeons, but to orthopedists and ophthalmologists the world over.

After another year away from Boston, in Oxford at Sir Charles Sherrington's physiology laboratories, Dr. Ingraham began his career at The Children's Hospital in 1929 as "Visiting Surgeon, Neurosurgery", a title which he held until 1946, when he was appointed Chief of the Neurosurgical Service.

During World War II, 1945 through 1947, Dr. Ingraham served as Acting Head of the Department of Surgery and Surgeon-in-Chief at The Children's Hospital. He became Associate Professor of Surgery at the Harvard Medical School in 1947, a title held until his retirement in 1964. The initial close liaison with the Peter Bent Brigham Hospital persists to this day, for the attending staff and resident staff of Children's Hospital serve also as the neurosurgical staff of the Peter Bent Brigham.

During World War II, Dr. Ingraham worked with Dr. Edwin J. Cohn in the development of fibrin foam, a precursor of the now common gelatin

foam or "Gelfoam" used as a hemostatic agent by neurosurgeons throughout the world. The neurosurgical laboratories in the Carnegie Building were established just after the war. Dr. Eben Alexander and Dr. Donald Matson first occupied these laboratories.

Dr. Ingraham's publications began to appear in 1929, first from Johns Hopkins, then from Oxford and the Peter Bent Brigham. In 1933 he wrote from Children's Hospital of 16 cases of intraspinal tumors in infancy and childhood, then the following year of subdural hematoma. This is a condition in which bleeding within the skull, but outside the brain, produces a blood clot which then liquefies and gradually expands, restricting the growth of the brain and enlarging the child's head out of proportion to the normal rate of growth. Thirty years later we are still dealing with this problem much in the manner which he then specified. It is interesting that his co-author for this paper is Dr. Henry Heyl, who is now Associate Professor of Anatomy at Dartmouth Medical School and editor of the widely read *Journal of Neurosurgery*.

In the years until his retirement in 1964, Dr. Ingraham headed a department which was prolific in the development of surgical techniques, and research into the mechanisms of production of hydrocephalus and in shunting devices to relieve this condition. Many men joined him in this work who are themselves now well known leaders in neurosurgery throughout this country and the world.

Dr. Edgar Bering, resident in 1949 in this program, remained to direct the neurosurgical laboratories until 1961. Much of the basic clinical and laboratory research on hydrocephalus was done here during this period under Dr. Bering's direction.

Dr. Joseph Galicich came to us from Minneapolis in 1961 and assumed the direction of the laboratories until 1967.

Dr. Donald Matson, now head of this department, joined Dr. Ingraham first as assistant resident in 1942 and then returned, after World War II, in 1946 as resident and then associate. A meticulous surgeon, inexhaustible teacher, and prolific writer, he collected the material and co-authored with Dr. Ingraham the text "Neurosurgery of Infancy and Childhood" which was first published in 1954 and is still looked upon as a most authoritative treatise in this field.

In 1957, after completing the residency program at Children's Hospital, Dr. John Shillito returned from an additional year in Memphis, Tenn., and joined Dr. Ingraham and Dr. Matson on the staff, and remains as Senior Associate Neurosurgeon.

Dr. Francis Rockett joined the staff on completion of his residency here in 1964, then, after two years, established his own practice in the surrounding communities. He is now Chief of Neurosurgery at the Newton-Wellesley Hospital and serves several other hospitals, while remaining on the staff at The Children's Hospital Medical Center and the Peter Bent Brigham. He attends weekly our neurosurgical out-patient clinic at Children's and brings many interesting patients to us.

In 1966, Dr. Larry K. Page, also an alumnus of this training program, joined our staff as Junior Associate. He lives in Hamilton, is neurosurgeon for the nearby Beverly Hospital, and with Dr. Matson and Dr. Shillito shares the full responsibility of the neurosurgical department at this hospital and at the Peter Bent Brigham Hospital.

We have four neurosurgical residents. Each year one resident completes a four-year training program with us, which consists of three years of clinical responsibility and one year spent in fields closely related to neurosurgery or in research. The attending and resident staff work both at the Children's Hospital and the Peter Bent Brigham Hospital, and the attending staff also at the Beverly Hospital, in addition to functioning in consultant capacity at many hospitals in Boston and the surrounding areas.

At The Children's Hospital Medical Center, we now enjoy a compact physical unit, consisting of 27 beds on the third floor, partly in the old Isolation Building and partly in the newer Farley Building. The department's offices are adjacent to this ward in the Bader Building, where we also see our private patients. Once weekly an out-patient clinic is held in the new Fegan Building, where 25 to 30 patients are seen by the entire resident staff and a member of the attending staff.

Activities: 1967 and 1968

This period will be remembered for many reasons. Our clinic moved from the familiar two-room, bench-lined corner of Building A to the third floor of the new Fegan Building. Although we miss the elbow-rubbing give and take of the old bustling clinic, where all students and residents could see each patient's problem without taking a step, the comfort and efficiency of the new quarters certainly returns to the patient the dignity deserved.

Both Dr. Matson and Dr. Shillito were honored by election to the office of presidency of large neurosurgical societies.

Assistance to our department arrived in the form of a neuroradiologist, Dr. Roy Strand, who now

teaches our residents and performs himself many of the highly technical diagnostic procedures which our specialty demands.

Dr. Matson wrote the second edition of "The Neurosurgery of Infancy and Childhood", a much more detailed and enlarged version of the original work, available by the late spring of 1969.

The Ingraham Chair of Neurosurgery was established at Harvard Medical School and Dr. Donald Matson was appointed its first incumbent as the Franc D. Ingraham Professor of Neurological Surgery, at the Children's Hospital Medical Center.

Dr. Joseph Galicich resigned in the summer of 1967 his post as Director of Neurosurgical Research Laboratories for a position at Yale University. His activities are sorely missed.

Dr. Matson, in early 1968, was afflicted with an illness which incapacitated him for the latter half of that year, although during much of this time he was able to remain in close contact with his Service, carrying out as many of his duties as possible from his hospital room.

The Neurosurgical Service, with 27 beds available, has had an average daily census of between 23 and 24 patients. In our three-hour, once-weekly, out-patient clinic, we see about 30 patients per clinic, totalling 1100 to 1200 patients per year.

In one academic year during this period, 136 operations upon the cranium were carried out; 43 for tumors, 58 to repair the effects of head injuries. There were 14 operations upon the spinal cord, 12 of which were for tumor. Congenital malformations have added 57 surgical procedures. Shunting operations for hydrocephalus numbered 137; there were six operations to repair damaged peripheral nerves and 203 delicate diagnostic procedures carried out which involve spinal taps, injections of arteries to outline their position by x-ray, or the introduction of air directly into the fluid channels of the brain for the detection of tumor or obstruction of spinal fluid circulation.

Our chief residents during this period were Dr. Edward Katz, finishing in June of 1967, and Dr. John Tew, who visited us from the Massachusetts General Hospital neurosurgical training program and who served six months as senior assistant resident and then as chief resident. Dr. Alan Rosenthal was our chief resident for the calendar year 1968.

Dr. Howard Eisenberg has been junior and senior assistant resident during this period and Dr. Edwin G. Fischer and Dr. Robin Davidson have served as junior assistant residents.

We have with us now Dr. Loren Amacher, for a year, from Dr. Charles Drake's training program in

London, Ontario. Dr. Amacher served as senior assistant resident for six months in 1968 and will be chief resident for the first half of 1969.

During this period Dr. Alan Rosenthal spent six months with Dr. Joseph Galicich in the neurosurgical research laboratory and six months with Dr. Floyd Gilles in neuropathology.

Dr. Howard Eisenberg has taken time away from the clinical service to spend six months in neurology at the National Hospital, Queen's Square, London, and another six months with Doctors Crigler and Fischer in neuroendocrinology, and also with Dr. Lorenzo in Dr. Barlow's neurology research laboratories. Here, Dr. Eisenberg completed experiments on the effects of steroids on epileptogenic lesions in the brain.

Dr. Edwin G. Fischer has spent three months in neurology with Dr. Tyler at the Peter Bent Brigham Hospital and three months with Dr. Derek Denny-Brown at the Primate Center in Marlboro, Mass., studying effects of stereotactically placed lesions in monkey brain.

We have enjoyed many colleagues from other centers and from overseas, both as temporary additions to our staff and as visitors.

Dr. Takeo Kuwabara from Tokyo worked as a research fellow in neurosurgery with Dr. Joseph Galicich for one year in the neurosurgical laboratories. Dr. Paul Welch of Providence, R. I., with a similar appointment, joined Dr. Galicich for one year also. Both participated in our clinical conferences and rounds as well as carrying out their research. Among the matters being investigated were the effects of both naturally produced and administered hormones in edema of the brain following injury, methods for monitoring the pressure inside the skull by electronic devices, a study of the effects of various diuretic drugs on intracranial pressure, and physiological studies of volume receptors within the thorax.

Dr. Khosrov Parsa from Tehran, Iran, spent three months with us as a clinical fellow in neurosurgery and Dr. Jean-Paul Chodkiewicz of Paris, six months as a research associate in neurosurgery; both were active clinically with our group in this hospital and the Peter Bent Brigham.

Among our neurosurgical visitors also were Mr. Kenneth Till from the Hospital for Sick Children, Great Ormond Street, London, Mr. Kevin Bleasel of Sydney, Australia, Dr. R. N. Chatterjee from Calcutta, India, and Dr. Eben Alexander, Professor of Neurosurgery at Bowman Gray School of Medicine, Winston-Salem, North Carolina. Dr. Alexander served as a Visiting Professor of Neurosur-

gery during a week in December of 1968. Dr. Alexander was formerly chief resident in this program in 1947.

Teaching Activities

The attending staff participated in teaching of Harvard Medical students at several levels of their training. A few lectures and patient demonstrations were given to the first year medical students each year, integrating their pre-clinical studies with patients' neurological problems. Smaller groups of students were taught during their introduction to the clinic, which occurs in the second year of medical school. The service was pleased to have individual students in rotation during their principal clinical year, while taking surgery, for two-week periods each, and to have several students elect a course in neurosurgery during their last year. During this course they spend at least one month with us working very closely with our resident staff.

Resident teaching is a major activity of the attending staff, not only in the operating room but on ward rounds, in the out-patient clinic, and in conferences. We are attempting to introduce our more senior residents to the details of private practice by having them see private patients in our office suite two afternoons a week, discuss the problems with us, and follow the patients through their subsequent hospitalization.

The number of residents in training at one time has been kept intentionally small in order to preserve the close liaison between attending staff and trainee which we feel is essential to the proper development of excellent surgical technique and competent, responsible, thoughtful patient care.

In addition, the attending staff participates in postgraduate teaching programs in this and in other hospitals, presents scientific papers at society meetings, functions on the committees of various local, national and international societies, and visits other neurosurgical centers.

In addition to Dr. Matson's completion of the revised text of "Neurosurgery in Infancy and Childhood", he has also worked closely with Miss Mildred Coddington on an Atlas of Neurosurgical Operations. Miss Coddington joins us in the operating room to make preliminary sketches of the various neurosurgical procedures, which she is now putting in finished form. This work will require another year or two for completion. Throughout this two-year period Dr. Matson was most active on the Board of Directors of the American Association of Neurological Surgeons (founded as the Harvey Cushing Society in 1931). He became President of this organization in April of 1968 in Chicago, and at that time

he presented in conjunction with Dr. John Crigler of our endocrinology service here a paper on "cranio-pharyngioma", a work of major importance since it describes not only the surgical technique for complete removal of these benign tumors at the base of the skull but also outlines the postoperative management of the many endocrinological problems which surgery in this area can create.

He was the opening speaker at the first European Congress of Pediatric Neurosurgery in Vienna in October of 1967. He took part in the Congress of Neurological Surgeons meeting in 1967, presenting a paper on the surgery of posterior fossa tumors and moderating a panel on subdural hematoma in infancy. He was Visiting Professor at the Mayo Clinic in February of 1968. At a meeting of all the neurosurgical program directors in Chicago in April, 1968, he gave the opening remarks and was instrumental in organizing this now annual workshop conference designed to improve undergraduate, resident and postgraduate teaching, and standards of neurosurgery throughout the country. He attended numerous other meetings and conferences.

Dr. Shillito, in March of 1967 took part in the 19th Annual Mid-west Cancer Conference, in Wichita, Kans., giving two discussions on tumors of the central nervous system in children. In September of that year, at the meeting of the New England Pediatric Society, he discussed the experience at Children's Hospital with 519 cases of craniostoma. He became Fellow of the American College of Surgeons in Chicago in October of 1967, attended the joint meeting of the Neurosurgical Society of America and the Society of British Neurosurgical Surgeons in New York City in October of 1967, and in San Francisco that same month at the Annual Meeting of the Congress of Neurological Surgeons, was installed as President of that organization. At the 1968 annual meeting of this Congress in Toronto he presided as President during a week-long meeting which featured presentations by our Canadian neurosurgical colleagues.

Dr. Page attended a conference in Lincoln, Neb., sponsored by the National Institutes of Neurosurgical Diseases and Blindness, and took part in a discussion on the role of trauma in the production of mental retardation. This meeting was in October of 1968.

In February of 1968 this department provided an exhibit at the 15th Annual Congress of the Association of Operating Room Nurses, held in Boston. Features of the exhibit included demonstrations of surgery for subdural hematoma, hydrocephalus, diastematomyelia, and repair of craniostoma.

During this two year period we were fortunate in having a National Institutes of Health Training Grant, which gives to our department financial assistance in staffing our research laboratories, enables us to send our residents to other centers for furtherance of their training, and allows us to bring teachers from other centers to this hospital. It also assists us in adequate compensation of our own teaching staff. We sincerely hope this support will be renewed.

The Ingraham Fund, known as the Kent fund prior to Dr. Ingraham's death in 1965, continues to grow, thanks to the generosity of so many of his patients and friends. Its resources are used where applicable to further research or education in the many problems with which we deal in children. Other special funds aid us in specific areas. We would like to express our gratitude to those who have made these resources available and for their continuing support.

The Future

To the present this Neurosurgical Department has contributed to medical knowledge principally by clearly spelling out the various neurosurgical conditions which exist in children and by bold yet meticulous surgical approaches to the alleviation of these problems. Throughout the history of the program the teaching of gentleness and thoroughness in surgery has left its mark on all of the men who have trained here.

We look forward to a continuing role in the care of children with neurosurgical problems, and the solution of still more of these problems. The continued relationship with neurosurgeon in training is, here, a very close relationship; we hope to achieve a still closer involvement with undergraduate medical student teaching.

There is much room for improvement of our knowledge in how to control better the malignant

tumors of the central nervous system. Although we can adequately control hydrocephalus in most cases, there still must be improvement in our surgical solutions of this problem. The role of surgery in the control of epilepsy in children has been well explored here, but there is room for much more work in this field. There has been renewed interest in the past few years in the treatment and rehabilitation of children with potentially crippling congenital anomalies, and our Myelodysplasia Clinic is a beginning effort to coordinate further the roles of the various specialties in the treatment of such children. The study of metabolic changes in the body following severe injuries to the brain needs more adequate quantitation and may ultimately help us to sustain the life of recently injured children who have the potential to recover.

Our Neurosurgical Laboratories will soon be restaffed, and with the completion of the new Research Building, expanded. There we will continue to take our difficult clinical problems for definition, experimentation, and perfection of techniques, working closely with the Departments of Neurology and Surgery.

We must address ourselves also to the problem of maintaining our quality of service as the demand and need for care increases. As this and other hospitals in which we serve enlarge and become more complex we must in the future enlarge our staff as necessary, yet insure that quality of care does not suffer and that there remains time for each of us to treat considerably not only the patient but also the parents.

Through all these changes we must be sure that we do not dilute the experience of the men we train so that excellence of our program remains that which it has been since its inception.

All of us in this department send Dr. Matson our sincerest hopes for his prompt and complete recovery.

REPORT OF THE SCHOOL OF NURSING AND NURSING SERVICE

Muriel B. Vesey, R.N.

In 1869, when The Children's Hospital opened its doors, the development of nursing schools which spread so rapidly in the last quarter of the nineteenth century had not begun, yet the by-laws of the hospital included among its purposes the: "instruction of young women in the duties of nurses and nursery aides". There can be little doubt but the impetus for this plan grew from the work of Miss Florence Nightingale in England where the Nightingale School at St. Thomas's Hospital had been established in 1860. Formal preparation for nursing was in the wind in those years, undoubtedly given further stimulus by the needs demonstrated during the War between the States. The first three schools in the United States opened in 1873, one in association with the Massachusetts General Hospital in Boston.

The Children's Hospital by-laws also provided for a "Lady Superintendent", "lady nurses" and "nurse pupils". The Lady Superintendent in the person of Mrs. Adeline Tyler was appointed with the hospital's founding.

The identification of two groups shows the influence of the Nightingale School where there were lady nurses, women of education and social position and pupil nurses who required more instruction. This plan never seems to have developed at The Children's Hospital although it is not clear how much training was given in the first twenty years nor indeed how all the nursing was provided. Certainly much of it was on a volunteer basis.

By 1891, the training had been formalized sufficiently for the Board of Managers to award seven diplomas to persons who had completed two years of training in the hospital. This first class included Ida C. Smith, who later became Superintendent of the hospital. Thus the school of nursing is eighty years old in 1969, having begun twenty years after the founding of the hospital.

Mrs. Adeline Tyler was a Deaconess in a Protestant religious order who had done nursing of the wounded in Baltimore during the Civil War. She remained in charge until 1872 when the Board of Managers approached the Sisters of St. Margaret, an Anglican Order established in England in 1854, and arranged for Sister Theresa Margaret to come as the new Lady Superintendent. Sister Theresa had had training in London Hospitals, including the Hospital for Sick Children in Great Osmond Street.

Subsequently the Sisters of St. Margaret established a branch of the order in Boston and a number of the Sisters contributed their services at The Children's Hospital. All of the Lady Superintend-

ents, until the Sisters' withdrawal from The Children's Hospital, were members of the Order. Some individual Sisters took the course after it was offered and a number of early graduates of the school joined the Sisterhood.

Early reports of the hospital testify to the devotion of these women to the care of children and it is clear that a high standard of nursing owed much to their work. The interest in nursing on the part of the Board of Managers and of the Medical Staff also is evident in the records.

The Children's Hospital owed much to the Sisterhood of St. Margaret for the remarkable contribution to the hospital in those early days. Equally as significant was their influence on the school of nursing; the far-sighted vision of those women in the earliest days of the school resulted in a sound educational plan, unusual in that day.

The Lady Superintendent of the Hospital was at that time the individual responsible for hospital administration and for nursing. Under hospital administration were included all aspects of maintenance, housekeeping, food service and supplies. This pattern continued in many hospitals into this century so that the individual known today as the hospital administrator not only ran the hospital but the nursing department, including the school, as well.

It was Sister Maria, who had succeeded Sister Theresa in 1887, who bore this responsibility when the school actually began. She was succeeded by Sister Caroline, under whose direction nursing became differentiated from hospital administration in 1899, when the Board of Managers consented to the appointment of a Superintendent of Nurses, and Miss Florence E. Baugh, a nurse trained in Philadelphia, assumed that position.

Some of the developments during Sister Caroline's tenure and that of her successors attest to their vision and that of the members of the Medical Staff who served on the Faculty or the Committee on the Training School.

Sister Caroline, although she gave up responsibility for the management of nursing, continued until 1906 as the Lady Superintendent, and was influential in bringing about many advances. Among the most notable was the arrangement in 1904 for students to attend Simmons College for four months' study. Such an ambitious plan was almost unique at that time and the school acquired an excellent reputation as evidenced by the large number of applicants and the demand for the services of its graduates.

After Miss Baugh resigned in 1900, having completed two years as Superintendent of Nurses, Sister Susanna succeeded, followed by Sister Amy in 1906.

Sister Amy was remembered affectionately by the early graduates of the school. She had been a member of the nursing staff, received the diploma of the school in 1902, became the first probation instructor, and was Superintendent of Nurses and Principal of the School from 1906 until 1913. She was the last of the Sisters to head the school; four years later the Sisters withdrew from their responsibilities at The Children's Hospital.

A Change in Direction

Thereafter several individuals held the position of Superintendent of Nurses for relatively brief periods among whom were Helen Wood, later Director of the School of Nursing at Simmons College, and Mary L. Wakefield who between 1920-1927 introduced new improvements in the program.

The year 1917 was a momentous one for it was in that year the United States entered World War I and nurses were needed for the military forces. At least fifty-five graduates of The Children's Hospital School of Nursing served in that war, approximately one-quarter of all who had graduated to that time.

That year was also the one in which the Sisters of St. Margaret withdrew from The Children's Hospital after nearly forty-years of service to the institution. The new Superintendent in 1917 was Ida C. Smith, a graduate of the Class of 1891 and before her appointment the head of the Out Patient Department. Miss Smith is still remembered by many as the gracious and devoted administrator until her retirement in 1933. She was the last nurse to be appointed hospital administrator.

In 1927, Stella Goostray, a graduate of the school in 1919, returned from the Philadelphia General Hospital where she had been successively science instructor and educational director, to assume the position of Superintendent of Nurses and Principal of the School of Nursing. Miss Goostray received the B.A. at Teachers College, Columbia University before returning to Boston and later a master's degree from the Boston University School of Education. She retained this post until her retirement in 1946, during which nineteen years there were many advances both in the school and in the nursing service.

During these years Miss Goostray was also influential on the national scene in an effort to improve the preparation of nurses, a need begin-

ning to be recommended by more and more nurses.

As hospital schools had proliferated in number in the late 1800's and in the early part of the twentieth century, a few farsighted nurses were aware of the serious deficiencies existing in the preparation of nurses and through the organizations established in 1890 began efforts at reform. The heavy hand of the past, the economics of hospital operation and the relatively weak position of women in this society all made the effort difficult. The history of the movement to improve nursing education is the record of continued struggle and slow progress. Many nurses, observing the improvements in medical education as a result of the reforms of the early 1900's, hoped that nursing might in some measure have a similar reform; many viewed with concern the inadequate graduate nurses from poor schools across the country and felt that improvement could come about only if better standards of education became common. Among the earliest struggles was the successful one to license nurses for practice. Another was the effort to require high school education for nurses entering the schools; as late as 1933 this became a requirement in Massachusetts, and the dates were later in some other states.

During Miss Goostray's tenure the school continued to move ahead so that in 1939, at its fiftieth anniversary, it was ready to be reviewed for accreditation by the newly formed accrediting service of the National League of Nursing Education. This came about in 1941 on the eve of the United States participation in World War II.

In the war years gains made in the 1930's and others contemplated for the future of necessity remained unfulfilled as the notion turned its attention to the overriding demands of the day.

Miss Goostray who had already been prominent in the effort to improve schools of nursing in the country carried a key responsibility as Chairman of the National Nursing Council for War Service, a group whose task was to increase the number of nurses being prepared while at the same time maintaining the best possible standards of nursing education. One result of the work of this group was the initiation of the United States Cadet Nurse Corps, in which The Children's Hospital School of Nursing was a participant.

As doctors and nurses went into service all hospitals and health services were strained and The Children's Hospital was not exempt. The Roll of Honor of the School lists 173 individuals who served with the Nurse Corps of the various military services.

World War II Ends

At the war's end the movement to improve nursing education accelerated and gained momentum with many consequences for hospital nursing schools including The Children's Hospital School of Nursing.

One of the greatest obstacles to educational improvement was the lack of distinction between a hospital's responsibility for care of patients and its charge to teach students of nursing. In most schools the superintendent of nurses was responsible for both and education often suffered as a consequence. The Sisters of St. Margaret at The Children's Hospital had no hesitation in discussing the need for more students to provide more service to patients; expansion of facilities required enlarging the school. This was the almost universal approach then and until very recently consequently forward steps were taken with difficulty, for always the question of financing a charitable institution arose. It is all the more remarkable that some schools and some individuals succeeded in offering courses of merit under such adverse conditions. That students supplied most of the patient care in hospitals with schools had two results: the first had to do with the quality of the educational program, which always took second place when money was scarce; and second, hospitals failed to recognize the true cost of maintaining a nursing service with paid staff. The transition of recent years has contributed to the rising cost of hospital operations as students' services now play a very small part in providing patient care.

In the 1890's in order to emphasize the educational function the Sisters introduced the term "faculty" to identify those individuals, many of them physicians, who taught nursing students. "Training school" was replaced by "school of nursing", or at least an effort was made to introduce the more appropriate terminology, and the Superintendent of Nurses became the Superintendent of Nurses and the Principal of the School. But there were very few persons with a school function exclusively and most of the teaching was done by the supervisors or head nurses.

As late as 1919 the entire graduate nurse staff consisted of thirteen registered nurses including teachers. This had quadrupled in 1929 and in 1969 it will be close to 300. Nursing supervisors and head nurses continued to carry most of the teaching responsibilities for many years so that the official count of full time teachers was two into the thirties. Today the faculty numbers twenty-four for The Children's Hospital students, and sixteen for the affiliate programs.

In 1956 the staffs of school and nursing service were separated and their responsibilities clarified.

This has had many advantages for the students and faculty since teachers can offer more effective instruction. There is some loss as well for the students may not have as many opportunities to learn in an informal way from experienced practitioners in nursing service but the gains far outweigh any possible losses.

The nursing service also was benefited from the change. In the past the nursing service as a department of the hospital distinct from the school failed to develop its own identity and the characteristics appropriate for the growing and complex institution. The separation, while it had many difficulties in achievement, allowed the department to approach a sounder organizational structure for a situation entirely different than twenty or thirty years ago.

The changes result not merely from the growth of the hospital as a whole or in the patient population, rather they relate to the vast changes in the nature of nursing employment in hospitals. Thirty years ago there were almost no nurses on the staff who were not graduates of The Children's Hospital. Today approximately two-thirds of the registered nurses on the staff are graduates of other schools. In the earlier day it was rare to employ a nurse who had not had experience in pediatric nursing beyond her basic course. Today each year there are employed a large number of nurses recently graduated from all kinds of schools. As is the case in all fields of employment today, a large number of the staff at any time are married women, many of them with children; in the 1930's there were none but the widowed or divorced.

In the old hospital wards the usual staff consisted of a head nurse, who sometimes was a senior student, a group of students and a maid. With changes in student programs more employed nurses entered the scene and it soon became evident that all of these could not be registered nurses, for two reasons: there were not enough to fill all the places, and their preparation was not needed to carry on the simpler tasks. Thus a differentiation of functions was necessary which has brought into being many new positions in hospital nursing services.

Today The Children's Hospital Medical Center Nursing Department has on its roster of positions approximately 300 registered nurses, 70 licensed practical nurses and 187 ancillary workers of different kinds including nursing aides, unit managers, secretaries, etc.

The job mobility of young nurses is high, posi-

tions being plentiful in all parts of the country so that the incentive to move is great, and as everyone knows employee expectations today are quite different from what they were before World War II. All of these elements require the department to offer programs of training and continuing education and to take different approaches to management so that the employees may be more involved in decision making.

The ordered world of the first quarter of the century, as it appears at least in retrospect, long since passed into history. The complexities of the present day are doubtless but a prelude to new problems but there is likelihood that better solutions will emerge as hospitals endeavor to use better management techniques.

The Future?

In the past there have been times when questions were raised about the wisdom of continuing the school of nursing in The Children's Hospital. Many special hospitals gave up their schools in the belief they could serve better as a clinical field for students from other programs. Many children's hospitals were rather limited in the range of the services they offered, and some were rather small. On the contrary this hospital had a very broad range of services and was expanding these as the years went by. However, it seemed wise on more than one occasion to conduct a study of the school as a result of one of which there was a definite recommendation that the school be closed because of the difficulties of presenting a rounded program and because of the long affiliations which were required. The Board of Trustees, however, did not accept this recommendation and the school continued.

There was concern again in 1948 when the report of Esther Lucille Brown, *Nursing for the Future*, recommended the closing of schools in specialized institutions.

The faculty anticipated that the issue would be raised in connection with an accreditation visit in 1952 since the Accreditation Service was known to frown upon the lack of parent school control with affiliations at that time necessitated. No such criticism was received, perhaps partly because in nursing circles there had begun to appear an awareness of the advantage of teaching nursing in a sequence from normal to abnormal, and from the beginnings of life to old age. This interest still continues so that in some schools today students learn nursing through early introduction to maternity care and the care of well children.

Graduates of this school have long believed, as a result of their own experiences as nursing students,

that the introduction to nursing techniques coming first with children has great advantages; it is gratifying that others in nursing education, from a different vantage point, are recognizing some of the same values. Thus this question is not likely to arise in the future. The school today, however, remains the only hospital school in a children's hospital in the United States.

There were other accreditation visits between 1952 and the present, the last being in 1966. During these years the efforts of the National League for Nursing to improve the quality of education in hospital schools made great strides and this school benefited as did others from good advice and occasionally from a little external pressure.

In the fifties arrangements were made to have three Children's Hospital faculty members accompany the students during their experience at the Peter Bent Brigham Hospital. As recently as 1968 an instructor was engaged to teach students during their psychiatric affiliation, which is now given at the Medfield State Hospital rather than at McLean Hospital as formerly.

These arrangements, in some degree, solve a problem which is of concern to the Council of Diploma Programs of the National League for Nursing with respect to the parent school's control of the program.

In 1964, it was decided to make a change in the first year college instruction by entering the students at Northeastern University rather than at Simmons College. The arrangement with Simmons, initiated in 1904, had continued over the years most successfully with fine cooperation of administration and faculty at the college. However adjustments that the faculty felt necessary were not possible at Simmons. The arrangements could be made at Northeastern. Students started there in 1964 for three quarters of instruction during which they earn the equivalent of twenty-six semester hours credit at Northeastern University. The quarter system has been most satisfactory and has been adopted throughout the entire program.

All of these changes have not been made without added cost both to students and to the hospital. Students now pay increased tuition which amounts to \$2050.00 in three years. They pay \$200.00 a year for housing and purchase their own meals throughout, except in the state institution. They also have to buy uniforms and books and meet a number of other fees. The total cash cost, exclusive of food purchases is approximately \$3000.00 in three years.

In the past few years the future of the School again has been considered in the light of trends in nursing education. The half century effort of nurses

through their organizations, and individually, to develop educational programs worthy of the name inevitably has led to the introduction of nursing education in colleges and universities. Critical has been the lack of such an educational base to prepare leaders for the profession. There is perhaps no group, unless it be the school teachers, which has had so many obstacles to overcome to obtain university education for its practitioners. It is curious in a period which has seen college offerings for a vast array of vocational fields and the conversion of technical schools to degree granting institutions that nursing has met with resistance to collegiate education from many sources, including some of its own members.

That so many good schools of nursing have developed in universities and more recently in junior colleges is an indication of the persistence and courage of some members of the profession. In 1965, the American Nurses Association issued a position paper on nursing education which stated that the education of nurses should move entirely into institutions of higher education and two types of nurses were needed: professional nurses prepared in senior colleges and technical nurses prepared in junior colleges. While the position had support from the majority of nurses there was much opposition from many physicians and hospital administrators.

It seems apparent that the movement will proceed for the logic is unassailable. Nurses need better education for their profession, college preparation for most fields is taken for granted and hospitals have been strained to support their schools. On the other hand the development is likely to be slow for private colleges have found nursing education like medical education to be very expensive and it appears that most such courses must be in publicly supported colleges.

Hospitals have been accused of opposing new trends and continuing their schools for unworthy reasons; past dependence upon students to staff hospitals has come back to haunt them. No one

who knows the facts about the cost of a hospital of currently conducting a school can be so naïve; the reasons for continuing are not financial. There are benefits in an atmosphere which students help to create and each institution hopes its graduates will join the staff. Perhaps even more influential is the recognition that registered nurses are in short supply throughout the country.

As late as 1966-67 71.8% of graduates of programs of nursing education — RN — came from the hospital diploma programs. The possibility that this supply might be cut off before new schools were established alarmed many people and accounted in part for objections to the position of the American Nursing Association. The federal government has been concerned as evidenced by the passage of the Nurse Training Act which continues to give support to nursing schools and to nursing students.

Weighing all these matters and peering into an uncertain future it was decided that the School must continue, it being an obligation to maintain an existing school provided of course that applicants continue to seek entrance.

If this School were to continue, it was evident that new facilities were an absolute necessity. Gardner House, opened in 1930, remains extraordinarily satisfactory as a residence but the lack of classroom, office and library space is such that there is no possibility of moving forward with new methods of teaching or of adequately housing faculty and even less hope of increasing the size of the school.

Thus in its eightieth year the school is seeking federal government funds and other funds to construct a new education building in a cooperative enterprise with the New England Deaconess Hospital. If successful both schools will enlarge and each will retain its identity but the two will share facilities wherever possible. Should this eventuate it is believed the school will continue for some time to come and that appropriate changes can be made as the current confused picture in nursing education becomes clarified.

DEPARTMENT OF OPHTHALMOLOGY

Richard M. Robb, M.D.

In the two years since the last narrative report from the Department of Ophthalmology there has been an expansion of personnel and activities reflecting active growth in a relatively small department. Some perspective is gained by recalling that ophthalmology at the Children's Hospital prior to 1965 was represented only as a consultation service provided by a group of physicians working primarily from their outside offices. Since that time the department has changed to a largely hospital-based unit with its main center of activity in the new Fegan Out-Patient Center. This location is a natural one in view of the large portion of ophthalmic practice customarily done in an out-patient setting.

Out-Patient Service

It is not surprising that the Eye Clinic has grown in size in this new environment. Its present proportions are suggested by the more than 3,000 out-patient visits to the clinic in the past year. Of these visits approximately two-thirds were for new patients. The Eye Clinic has also spawned a significant offspring, the Ocular Motility Clinic established in January 1968. This unit helps immeasurably in the evaluation and management of our many patients with strabismus. It is ably staffed by Mrs. Susan Ketteringham, an orthoptist trained at Moorfields Eye Hospital in London and at the Massachusetts Eye and Ear Infirmary. Mrs. Ketteringham, in addition, has helped to teach orthoptic students sent to the Children's by the Massachusetts Eye and Ear Infirmary for further clinical experience. In view of our growing wealth of clinical material, we anticipate creating our own preceptorship in orthoptics in the near future.

Professional and Resident Staff

The departure of Dr. Robert Petersen for two year's service in the United States Army in August 1967, left an important gap in the professional staff of our department. We were particularly fortunate shortly thereafter to gain the services of Dr. David Walton as an associate in ophthalmology. Dr. Walton had interned at Children's Hospital in 1961-62 before starting his training in ophthalmology. He has retained a penetrating interest in children and a warm understanding of them, and now brings to the department highly valuable experience linking the fields of ophthalmology and pediatrics. Dr. Walton has recently assumed responsibility for the care of patients with congenital glaucoma, a particularly demanding area in ophthalmology. In this connection he is carrying out a study of the surgical management of glaucoma with Dr. W. Morton Grant of the Howe Laboratory of Ophthalmology of Harvard University.

We have also been fortunate to have at Children's, since August 1967, senior residents in ophthalmology from the Massachusetts Eye and Ear Infirmary. These residents come to Children's, for six weeks each, highly trained in ophthalmology. It is a challenge for them and a continuing interest for us to bring this training to bear on pediatric problems. The residents have valued the opportunity to consult on our medical and neurologic services and have benefitted from the rich variety of clinical material which Children's Hospital provides. Their presence in the department has been a constant stimulus to the staff to crystalize experience in order that it can be used effectively for teaching.

Research

For some time it has seemed that an electrophysiologic approach to the study of vision would be particularly important in the area of pediatric ophthalmology. One reason is that subjective testing is often difficult in younger children. An early expression of our interest in this approach was a collaborative study by Dr. Robb of this department and Dr. Frank Duffy and Dr. Cesare Lombroso of the Department of Neurology to measure the electrical activity of the brain in response to visual stimulation. A group of amblyopic children were studied using computer summated responses, and results indicated abnormal electrical activity associated with stimulation of amblyopic eyes. A recent award of a Public Health Service grant to continue this research will allow further investigations to be made.

An important broadening of scope of our professional staff, in keeping with this interest in electrophysiology, was the appointment of Dr. Eliot Berson in August 1968 as associate in ophthalmology. Having completed his ophthalmic training in St. Louis, Dr. Berson served as a clinical associate at the National Institutes of Health before coming to Children's. In the Institute of Neurological Diseases and Blindness he actively participated in a study of retinal degenerations and became thoroughly familiar with electroretinography, a technique for measuring the electrical activity of the retina in response to light. Dr. Berson has already established facilities in the department for clinical electroretinography, and he plans to carry this interest into a laboratory setting in the new Pediatric Sciences Building now under construction. He is presently also engaged in a study of an early retinal receptor potential in collaboration with Dr. Bruce Goldstein, a research associate in the Department of Biology of Harvard University.

Having in a few years moved rapidly toward the goal of establishing an active clinical service, and having in the past year become involved in the training of resident physicians, we look forward in the department to the opportunity to create in the new Pediatric Sciences Building a laboratory facility which will allow us to study experimentally some of the problems encountered in our patients.

High priority will be given to the electrophysiology unit mentioned above and to an experimental pathology section which will allow the study of eyes with histochemical and electron microscopic techniques. The pursuit of excellence in these areas of patient care, teaching, and research will be a worthy goal for us in the second century of Children's Hospital.

ORTHOPEDIC DEPARTMENT

Arthur M. Pappas, M.D.

Since its opening in 1869, the Children's Hospital Medical Center has been a leader in the development of concepts and methods of treatment for orthopedic problems of infancy and childhood. The fact that this hospital was to play such an important role in orthopedics was heralded by two of its first patients, one child with a fractured radius, another with a dislocated hip. Of the 30 patients admitted to the hospital in 1869, its first year of operation, eighteen had problems that were orthopedic in nature.

Among the original doctors, the one to whom the Orthopedic Department owes its greatest debt is Dr. Edward Hickling Bradford. He was a general surgeon at the Boston City Hospital until he came to be influenced by Dr. John Ball Brown and Dr. Brown's younger son, Dr. Buckminster Brown. The elder Dr. Brown, one of the first doctors in this country to devote himself to the care of the crippled child, founded the Boston Orthopedic Institute, which was continued by Buckminster Brown after his graduation from Harvard Medical School in 1844.

It was Buckminster Brown who started an orthopedic ward at the Good Samaritan Hospital and attracted Dr. Edward Hickling Bradford to the field of orthopedic surgery. Dr. Bradford was one of the first surgeons in this country to limit his practice to problems of the musculoskeletal system. In 1877 Dr. Bradford was appointed the first Chief of the Orthopedic Service at the Children's Hospital. He proved to be one of the greatest forces in the history of the specialty. One of the founders of the American Orthopedic Association in 1887, he was elected its president in 1888.

Dr. Bradford was especially interested in the surgical treatment of spastic paralysis in children, the operative treatment of club feet, and the correction of lateral curvature of the spine. Between the years 1877 and 1903, he was credited with writing 105 articles on subjects pertinent to the orthopedic problems of children.

Dr. Bradford was able to attract to the Children's Hospital doctors who later became prominent in the field of orthopedics — Joel Goldthwait, Edward G. Brackett, Robert Lovett, James Warren Sever, Robert Osgood, Arthur Legg, and Frank Ober. Goldthwait wrote on tendon transplantation and methods to correct dislocation of the patella; Brackett perfected operations on the knee, spine, and hip, and later became Editor of the *Journal of Bone and Joint Surgery*; Dr. Robert Lovett, in cooperation with Dr. Bradford, co-authored *Textbooks of Orthopedics*, which became a classic in the field;

Sever performed extensive animal experimentation on tendon regeneration and presented the classical works on obstetrical paralysis; Dr. Arthur Legg described the affection of the hip joint in 1910 that carries his name and made such significant contributions in the field of rehabilitation for the residuals of poliomyelitis, that a functional training room for the crippled individuals was dedicated at the Hospital in 1939 as a tribute to his work.

The new Children's Hospital progressed quite rapidly and in 1874 opened a Convalescent Home for a long-term recuperation after treatment in the hospital. The Convalescent Home, initially located in the town of Weston, was later moved to larger accommodation in Wellesley. In 1874, the same year that the Convalescent Home was started, the Out-patient Departments were opened at the Children's Hospital. The Convalescent Home was especially important for the long-term care of orthopedic problems, both surgical and non-surgical, which were being seen at the Children's Hospital.

Associated with the expansion of hospital activities was the opening of the Surgical Appliance Shop in 1884 for the manufacture of "splints and apparatus" to aid crippled and deformed children. An innovation for its time, this represented one of the first central units.

The first special clinic in Children's Hospital devoted to a particular disease or problem was the Lateral Curvature Clinic (scoliosis) developed in 1897. Although such special clinics are commonplace today, in its time it signalled a new phase of orthopedics and medicine.

This Lateral Curvature Clinic was attended and greatly influenced by young ladies from the Boston Normal School for Gymnastics who devised therapeutic exercise programs to improve the general muscular condition and increase the flexibility of the spine. The treatments they prescribed at the clinic were carried out at the hospital and at home. These students actually represented the beginning of physical therapy at Children's, as they were required to spend eight months of their education at Children's. In 1905 a permanent exercise instructor was appointed at the hospital. In 1911 a separate Infantile Paralysis Clinic was established which initiated the main road that Physical Therapy would follow for many years. By 1914 the Hospital had a Director of Physical Therapeutics.

In 1903 Dr. Bradford became the first full Professor of Orthopedic Surgery at the Harvard Medical School and an independent Orthopedic Department was developed at the Children's Hospital. It was during his regime that a regular teaching sche-

dule in orthopedic surgery at Harvard Medical School was instituted. He retired as Professor of Orthopedic Surgery and became Dean of the Harvard Medical School from 1912 to 1918 and then a member of the College's Board of Overseers.

In 1912 Dr. Robert Lovett succeeded Dr. Bradford as Chief Orthopedic Surgeon at Children's

When a Chair was established and funded at Harvard Medical School in honor of Dr. John Ball Brown and Dr. Buckminster Brown in 1915, Dr. Lovett became the first incumbent. During his first few years, the Children's Hospital moved to a new building on Longwood Avenue adjacent to the Medical School. With this step, orthopedic surgery became a permanently important part of teaching to the students in both undergraduate and graduate medical programs. By 1913 there was a Resident in Orthopedic Surgery and Grand Rounds were established as a training experience. His outstanding text, *Orthopedic Surgery*, co-authored with Sir Robert Jones, became a standard reference for many principles of treatment.

Dr. Lovett had a particular interest in poliomyelitis and made monumental contributions to the understanding of the varying stages of the disease, considerations for treatment, techniques of physical therapy and muscle reeducation, and the organization of medical care to make available the best facilities to the largest segment of the affected population. He developed techniques for evaluating and grading muscle power, in collaboration with the Physiology Department of Harvard Medical School and Wilhelmina Wright of the Children's Hospital Physical Therapy staff. His work in this area was found to be extremely valuable in 1916 when a severe epidemic of poliomyelitis hit the Northeast part of the country. It was then that Dr. Lovett became instrumental in developing the regional aspects of care for patients with poliomyelitis. This entire concept of care was organized under the Harvard Infantile Paralysis Commission and formed for the care and investigation of anterior poliomyelitis. This Clinic was the forerunner and prototype for many clinics providing care for the chronically handicapped the country over. The concept of a central supervising clinic being held at the Children's Hospital and regional treatment centers held in the surrounding towns provided excellent continuity of care for patients with poliomyelitis and made maximum utilization of the ancillary personnel for their care.

In 1916, with Dr. Bradford as Dean of the Medical School and with Dr. Lovett as Chief of Orthopedic Surgery at Children's Hospital, orthopedic

surgery became a required subject for every fourth-year student at the Harvard Medical School, tremendously increasing the teaching load for the Service.

With the entrance of the United States into World War I, the training capacities at Children's Hospital were more heavily taxed as it had been chosen one of the hospitals for intensive training of military surgeons in orthopedic surgery. By 1918, 201 doctors had received the organized military orthopedic training course. Many of these doctors later expanded their interest in the field of orthopedics and after the War became leaders in the specialty. During this time, the Harvard Graduate School opened the course to train women to serve in military rehabilitation hospitals as exercise therapists. Many of the "reconstruction aides" who received this course of instruction later became leaders in physical therapy.

During 1921 an eighteen-month graduate course was begun, coordinating the services of the Children's Hospital and the Massachusetts General Hospital for doctors intending to specialize in orthopedic surgery. Initially this program was under the auspices of the Harvard Medical School Courses for Graduates although it later became an independent training program.

Dr. Lovett retired in 1922 and was succeeded by Dr. Robert B. Osgood. Dr. Osgood's first association with the Children's Hospital was as a roentgenologist in 1902-03. He subsequently obtained training in orthopedic surgery and was Orthopedic Surgeon-in-Chief at the Massachusetts General Hospital from which he resigned to become Orthopedic Surgeon-in-Chief at the Children's Hospital. As Orthopedic Consultant to the Surgeon General during World War I, Dr. Osgood contributed countless improvements for the care of military casualties. While stationed in Great Britain, he worked closely with Sir Robert Jones and was one of the founders of the British Orthopedic Association.

Dr. Osgood was the second John Ball and Buckminster Brown Professor of Orthopedic Surgery. His major contributions were in the fields of arthritis and general crippling diseases. Many of his contributions in the description of the roentgenographic changes associated with arthritis. One of his classic descriptions was a lesion of the tibial tubercle that is currently known as Osgood-Schlatter's disease. Under Dr. Osgood's influence, the teaching activities of the department were greatly expanded, official weekly Rounds organized, and the number of house officers was increased.

Dr. Osgood contributed generally of his personal

philosophy for the development of superior programs for the care of crippled children. In this role he was one of the original advisors to the Children's Bureau in Washington for its development of crippled children's programs. He retired in 1931 and was succeeded both as the Orthopedic Surgeon-in-Chief at the Children's Hospital and the John Ball and Buckminster Brown Clinical Professor of Orthopedic Surgery by Dr. Frank R. Ober.

Dr. Ober initially became associated with the Children's Hospital in 1913 as a house officer. After completing his training he proceeded to develop outstanding skill with surgical techniques and developed a series of procedures for such problems as recurrent dislocation of the patella, low-back pain, congenital equinovarus feet, and posterior drainage of the hip joint. He fostered interest in methods of surgical reconstruction and rehabilitation for various paralytic diseases and congenital abnormalities. During Dr. Ober's regime, the length of the resident training program was expanded to three years; one year each at the Children's Hospital and the Massachusetts General Hospital with an elective terminal year either at the parent institution or another hospital. Because of the increasing clinical teaching demands on the Service, he felt it would be desirable to provide a geographic full-time staff member to coordinate the program of teaching and research efforts. It was in this capacity that Dr. William T. Green joined the staff of the Children's Hospital.

Dr. Ober was extremely active in national orthopedic endeavors and in the general fields of medicine. He served as President of the American Orthopaedic Association, and President of the Massachusetts Medical Society. It was during his tenure as Assistant Dean of Harvard Medical School, in charge of Courses for Graduates, that post-graduate instruction was instituted as part of the Massachusetts Medical Society program and the establishment of New England Post-Graduate Assemblies.

During World War II the number of orthopedic staff and resident surgeons decreased sharply. Teaching demands increased as the Medical school had been shortened to three years, requiring the teaching of medical students in addition to military orthopedists the year round. This was complicated by another epidemic of infantile paralysis in 1944. In an attempt to discontinue all direct patient care relationships, the Harvard Medical School transferred the functions of the Harvard Infantile Paralysis Clinic to the Children's Hospital in 1946. Accordingly, this was then organized as the Massachusetts Infantile Paralysis Clinics of the Children's Hos-

pital. Through their years of existence, the Harvard Infantile Paralysis Clinic and the Massachusetts Infantile Paralysis Clinics were leading factors in determining standards and methods of care for patients with acute and residual poliomyelitis.

When Dr. Ober retired in 1946, he was succeeded by Dr. William T. Green as Orthopedic Surgeon-in-Chief. Dr. Green had joined the house staff of the Children's Hospital in 1930, and in 1931 he became the first geographical full-time appointee to the staff of the Children's Hospital. Some of his primary interests were institution of a research program for house officers and developing a study of the growth of children. In 1939 he succeeded Arthur Legg as Director of the Harvard Infantile Paralysis Clinic. During this time he developed various surgical techniques for the correction of both paralytic and spastic deformities.

As Orthopedic Surgeon-in-Chief, Dr. Green instituted an extensive program for the investigation of growth characteristics of the lower extremities. With the assistance of Miss Margaret Anderson, the Growth Study has developed methods to determine the annual rates of normal growth that are used as international standards for predicting the amount of remaining growth and timing or surgical procedures to correct inequality of extremities. In addition, he developed surgical techniques for repair of dislocating patellae, congenital elevation of the scapula, Volkmann's contracture, and obstetrical palsy. One of the outstanding teachers he encouraged in this area was Dr. David Grice. In collaboration with Dr. Green, Dr. Grice developed an operative procedure for stabilizing paralytic feet that continues to be commonly used.

In the field of medical education Dr. Green's contributions included expansion of the course for third and fourth year Harvard Medical students; expansion of the coordinated residency program between the Children's Hospital, the Massachusetts General Hospital, and the Peter Bent Brigham Hospital at $3\frac{1}{2}$ years with a total of 28 residents in the program at any one time. There was increased staff interest in the Harvard Medical School Courses for Graduates with many international orthopedic surgeons spending from a few months to as long as two years at the Children's Hospital. Many of the trainees who have been with Dr. Green in a geographical full-time status have gone on to head up major departments of orthopedic surgery in hospitals throughout the country. As Orthopedic Surgeon-in-Chief, when the Harvard Medical School elected to discontinue relationship with direct patient care activities, Dr. Green arranged a co-

ordinated physical therapy program for Simmons College students, leading to a degree from the College. In 1962 Dr. William T. Green became the first Harriet M. Peabody Professor of Orthopedic Surgery. This Chair was established by the Harriet M. Peabody Fund to provide for the care and treatment of crippled children and to aid research of crippling diseases.

During his tenure as Orthopedic Surgeon-in-Chief, Dr. Green served as President of the American Board of Orthopaedic Surgery, the American Academy of Orthopaedic Surgeons, and the American Academy for Cerebral Palsy. In addition, he has been Consultant to the Children's Bureau of Vocational and Rehabilitation Services. Dr. Green became Orthopedic Surgeon-in-Chief, Emeritus, and Harriet M. Peabody Professor of Orthopedic Surgery, Emeritus, in 1968.

In the past decade we have seen a remarkable change of emphasis in the general area of pediatric orthopedics. Whereas poliomyelitis was the leading diagnosis for numbers of admissions to the Orthopedic Service during the 1950's and accounted for over 10,000 visits a year to the Poliomyelitis Clinic, it has become a medical rarity to see a case of acute poliomyelitis; in the past year there were less than 1,000 visits to the Poliomyelitis Clinic. Of course, the reason for this tremendous decrease in poliomyelitis can be directly traced to The Children's Hospital Medical Center, where Dr. John Enders developed the techniques for isolating and growing polio virus in tissue culture to be used for the vaccine.

In spite of this precipitous fall-off of poliomyelitis, the orthopedic census has been gradually increasing. During the past ten years, there has been approximately a 25 percent increase in our total number of in-patient hospital days.

Our positive change in census expresses the concept that Children's Hospital is truly a Medical Center for a large segment of our population. In part, the increase in census can be related to an increasing population; however, there are other social and medical changes that are related. Rapid progress in the field of communications and travel has encouraged the centralization of care for specific medical problems. As these problems require multiple disciplines for their complete evaluation and treatment, many families and their physicians encourage the concept of regionalization for the care of certain medical and surgical problems. Another fact that appears to have some relationship is the increase of governmental participation in providing medical care in Title 19 of Medicaid.

Within our own department, certain changes have been necessitated by the changing pattern of orthopedic problems and patients' needs. The Mary MacArthur Memorial Respirator Unit has become less necessary in its original conception and is now known as the Mary MacArthur Memorial Respiratory and Rehabilitation Unit. This permits us to provide a better rehabilitation program for children with chronic crippling musculoskeletal diseases. The long-term care of these children poses many problems apart from their physical infirmity. Their social, educational, vocational, and emotional needs require a specialized staff that has not been as available nor as coordinated for patient care as necessary. Although their medical care, in the traditional sense, is less demanding, the other problems require a staff that proves to be as expensive as that for the acutely-ill child and, therefore, demands the same rate for hospital reimbursement.

This concept of interdisciplinary needs as well as the financial coverage to provide these needs has not been well accepted by many of the funding agencies to this time and has restricted overdue progress in this field. Currently we are planning to coordinate efforts in the area of rehabilitation with the ultimate goal of a more complete unit for the total care of children with physical handicaps.

The out-patient clinics involving multiple disciplines are attracting a larger population because they are able to combine the talents of multiple specialty areas headed by individual staff physicians with specific interests. For example, our Cerebral Palsy Clinic combines the interest of the orthopedic surgeon (Dr. Banks, Dr. Panagakos), pediatrics and neurology. As there is an ever-increasing total number in the Cerebral Palsy Clinic population and the methods of treatment and the rationale for the varying methods of treatment vary so greatly the country over, it appeared to be a natural place to develop a prospective study to evaluate the different methods of treatment. The initial stages of such a study have been the mutual education of members of the varying disciplines as to the development of an objective record that will produce a high degree of correlation. As the study has gradually widened its scope, it has developed close cooperation with other areas: Ophthalmology, Hearing and Speech, Psychology, and Neurophysiology (Seizure). As this study has been carried on as an out-patient activity, we are handicapped by the lack of an adequate Day Center for vocational evaluation and rehabilitation. Hopefully this will be developed in relation to both the in-patient rehabilitation area and out-patient clinic area.

The Myelodysplasia Clinic (Dr. Trott) is a natural development for members of our staff who are familiar with poliomyelitis. The paralytic problems and related abnormalities that children with myelodysplasia present are very similar to those encountered in the past in patients with poliomyelitis. This Clinic meets in conjunction with Neurosurgery and General Surgery (Urology), providing a complete approach for children with this birth defect and its multiple related problems.

The Arthritis Clinic (Dr. Griffin, Dr. Thomson) is staffed by members of both the Orthopedic and Pediatric Departments. The children are seen by members of each department at the time of their clinic visit and their total care program coordinated under this joint guidance. The increasing numbers enrolled in this clinic has necessitated its being scheduled on a weekly basis, rather than on a monthly basis as it was originally developed.

Our newest clinic is the Prosthetic Clinic. This clinic meets on a monthly basis and sees children who have either congenital, surgical, or traumatic amputations. It combines the efforts of the Orthopedic (Dr. Griffin, Dr. Thomson), Psychiatry, and Physical Therapy Departments. This clinic is working in close conjunction with the Crippled Children's Services of Massachusetts in order to provide better care for these handicapped children. When these children are admitted as in-patients, they are housed in the Mary MacArthur Rehabilitation area to maintain continuity of their coordinated program.

In the near future we plan to develop a Neuromuscular Clinic that will have a combined staff representing the Orthopedic and Neurology Departments as well as representatives of the Neurophysiology and Electromyography divisions and a Pathologist who has a special interest in the neuromuscular diseases of children. Most of the neuromuscular diseases of childhood are not well classified at this time and the pathophysiology less well understood. It is our hope to be able to provide a program to improve the care for these children as well as to elucidate the mechanisms by which these diseases affect their function and development.

As the trend for increasing regionalization for the care of unusual and difficult medical and surgical problems increases, we anticipate that our clinic and in-patient census will appreciate a continuing growth reflecting our increased knowledge and ability in the respective areas.

Members of our Staff instruct Harvard Medical School students during all four years of their curriculum: first year, anatomy; second year, patho-

physiology of the musculoskeletal system; third and fourth years, Introduction to the Clinic and Principal Clinical Year instruction. Our teaching has been well received by the students, with the ultimate test being the increasing number of students from the Harvard Medical School entering the field of Orthopedics as the specialty of their choice.

Our Resident Training Program continues as a three and a half year period plus optional laboratory time; and in July 1968 the number of incoming residents was increased to twelve per year, three starting every three months (July, October, January, April). All residents have had at least two years of internship and residency after medical school before starting the Combined Orthopedic Residency Program. They all spend the first nine months of their program at the Children's Hospital Medical Center, rotating their experiences between the in-patient divisions, the general clinics, and the specialty clinics. After the nine months at Children's Hospital, they spend fifteen consecutive months at the Massachusetts General Hospital, and then return to the Children's Hospital for an additional six months of training. The next six-month period is spent at two of six affiliated hospitals: Robert Breck Brigham, Peter Bent Brigham, West Roxbury Veterans Administration, Beth Israel, Lemuel Shattuck, and Lynn Hospitals. Following these rotations, the residents spend six months as Chief Resident at one selected hospital. Therefore, at any one time we will have 42 residents enrolled in our training program in addition to the Fellows working in the laboratory or receiving additional training in special clinical areas.

We actively encourage the resident orthopedic surgeon to spend time in the laboratory and develop a basic scientific interest. Many residents choose to spend a period of six months to one year in the laboratory prior to starting their formal orthopedic residency. When these doctors develop interests in the laboratory early, their foundation is greatly broadened for a better understanding of the biological performances of the musculoskeletal system and its responses to varying stresses and surgical procedures. The laboratory work of many of these individuals has resulted in presentations at national and regional meetings. Our research program has been gradually increasing in scope as new laboratory space has become available to us. We anticipate a greater enhancement of our research efforts when the new Pediatric Science Building opens in 1970.

Dr. Cohen has maintained a continuing interest in the reaction of different tissues and their cellular components to biological implant materials. These

endeavors are both to evaluate the general clinical response to metal implants as well as to understand better some of the details of the cellular reactions to different implant components. Some of these projects are in conjunction with members of the Mechanical Engineering staff of the Massachusetts Institute of Technology as they employ various physical and biochemical experiments to determine the effect of stress and fatigue on biomedical metal implants. Another method being used to investigate the problem of cellular response is time-lapse cine photomicrography.

Dr. Pappas has continued his interest in two general areas: the experimental production of congenital abnormalities following exposure to different chemical, drug or immunological teratogens, and the evaluation of varying methods of bone preservation and transplantation. While studying the factors involved in the abnormalities of development, we have gained considerable information as to the time-related sequence of embryogenesis and the interrelationships of limb formation. As we are able to more closely evaluate the interactions in the development of the skeletal system, we will be able to understand better not only the development of malformations but the potential for their maximum correction.

Through studies on the preservation and transplantation of bone grafts, we have attempted to define the individual factors responsible for the success and failure of bone grafts. The cellular components of a bone graft and their contribution to osteogenesis is being carefully reviewed to determine the relative import of cells and matrix. As a part of this study, we are developing a composite graft, using the cells of one source grown in tissue culture for a long period and the acellular matrix from another source. Conceptually, this should provide a bone graft of less transplantation response antigen potential and a better healing response because of the added viable cellular component.

Our major combined basic and clinical research endeavor continues to be the Growth Study. Having over 5,000 children enrolled in the Growth Study at different times, we have been able to accumulate data on the natural pattern of development for many growth abnormalities. These growing abnormalities represent both systemic or generalized disturbances of growth as well as asymmetric disturbances of growth. This data presents a scientific collector's item not available anywhere else on earth. The data already derived from these records has been used to develop standards of growth for orthopedic surgeons and physical an-

thropologists the world over.

A new clinical research endeavor being planned at this time is the biomechanics laboratory for a more careful electrophysiologic assessment of individual muscle function and coordinated muscle patterns. This area is most important in the understanding of paralytic muscle disease, generalized neuromuscular disorders, the development of actual functional potential of congenital malformations, the improvement of current prosthetic functioning units, and hopefully the development of better prosthetic units related to the electrophysiologic aspects of neuromuscular function.

Orthopedic Surgery at the Children's Hospital Medical Center has traditionally been one of the leading units in this country. This heritage of clinical superiority must not be lost; our horizons must be expanded in light of the newer technical and biological changes in neuromusculoskeletal physiology and biology. The Department of Orthopedic Surgery has a definite commitment to the diversification that will be permitted by the new building program and the training of surgeons with a basic scientific interest to aid crippled children.

House Staff — Orthopedic Department (July 1966 — March 1969):

Chief Resident:

Charles L. Renshaw	7-1-66-12-31-66
Carl F. Brunjes	1-1-67-6-30-67
William T. Green, Jr.	7-1-67-12-31-67
E. William Schmitt, Jr.	1-1-68-6-30-68
Edwin T. Preston	7-1-68-12-31-68
Francis O'Connell	1-1-69-6-30-69

Resident:

Michael A. Ashworth	4-1-66-9-30-66
Benjamin E. Bierbaum	4-1-66-9-30-66
Richard G. McCollum	4-1-66-9-30-66
William T. Green, Jr.	7-1-66-12-31-66
Mohinder Mital	10-1-66-3-31-67
Norton Lithwick	10-1-66-3-31-67
Joseph S. Barr, Jr.	1-1-67-6-30-67
E. William Schmitt, Jr.	1-1-67-6-30-67
Allen Lewis	4-1-67-9-30-67
Won H. Oh	4-1-67-9-30-67
Edwin T. Preston	7-1-67-12-31-67
William H. Simon	7-1-67-12-31-67
Sandra J. Thomson	7-1-67-6-30-68
Robert B. Keller	10-1-67-3-31-68
Arthur L. Boland	10-1-67-3-31-68
Harris S. Yett	1-1-68-6-30-68
Francis O'Connell	1-1-68-6-30-68
Frederick Ewald	4-1-68-9-30-68
Lawrence Shields	4-1-68-9-30-68
James I. Huddleston	7-1-68-12-31-68
Hugh G. Watts	7-1-68-12-31-68
Richard Burton	10-1-68-3-31-69

Gerard A. Dehner	10-1-68-3-31-69	Marc A. Asher	4-1-67-3-31-68
Stuart Cope	1-1-69-6-30-69	Michael Goldberg	7-1-67-6-30-68
Norman Beisaw	1-1-69-6-30-69	James H. Herndon	7-1-67-6-30-68
Charles M. Smith	1-1-69-6-30-69	Robert W. Hussey	10-1-67-9-30-68
Senior Assistant Resident:		Robert E. Steele, Jr.	10-1-67-9-30-68
James P. McElhinney	7-1-68-6-30-69	Richard V. Cronk	1-1-68-12-31-68
Assistant Resident:		Ronald H. Geiger	1-1-68-12-31-68
Frederick Ewald	4-1-66-3-31-67	Barry L. Lindenbaum	4-1-68-3-31-69
Lawrence Shields	4-1-66-3-31-67	John R. Ream, Jr.	4-1-68-3-31-69
Harris S. Yett	7-1-66-12-31-66	Peter L. Weingarten	7-1-68-3-31-69
James I. Huddleston	7-1-66-6-30-67	Dinesh Patel	7-1-68-3-31-69
Hugh G. Watts	7-1-66-6-30-67	Roger N. Williams	9-1-68-6-30-69
Richard Burton	10-1-66-9-30-67	John E. Kenzora	9-1-68-6-30-69
Gerard A. Dehner	10-1-66-9-30-67	David T. Greenleaf	11-1-68-9-30-69
Stuart Cope	1-1-67-12-31-67	Frederick W. Bost, II	11-1-68-6-30-69
Norman Beisaw	1-1-67-12-31-67	Lyle J. Micheli	1-1-69-9-30-69
Robert Poss	4-1-67-3-31-68	John P. Barrett, Jr.	1-1-69-9-30-69
		Ben R. Thebaut, Jr.	1-1-69-9-30-69

DEPARTMENT OF OTOLARYNGOLOGY

Carlyle G. Flake, M.D.

Since the first hundred years are said to be the hardest, now may be a suitable time to take a look at the past and recognize the debt we owe to those who made outstanding contributions both to the hospital and to Otolaryngology.

Otolaryngology was not a recognized specialty until around the turn of the century. The first vestige of an ear, nose and throat service began in 1885 with the appointment of Dr. S. W. Langmaid as "Surgeon for Diseases of the Throat". Four years later the hospital report for 1889 recorded that "The Board has established a branch for the treatment of diseases of the throat and placed it under the care of Dr. S. W. Langmaid who has long been connected with the institution". As the activities of the "branch" increased, more throat surgeons were appointed to deal with the increased demand for their services. Space and equipment seemed to be a constant problem. The various moves of the hospital were greeted in the yearly reports of the Department with glowing descriptions of the adequacy of space and equipment, only to be followed in a few years by reports of even greater activity and need for more space and better equipment.

In the 1890's, as the work of the European ear surgeons became established and disseminated, aural surgeons were added to the staff and the era of the simple mastoid operation with its subsequent variations came into being. This period lasted until the early 1940's when the antimicrobial drugs made acute surgical mastoiditis almost the rarity it has become today.

The specialty of Otolaryngology reached its full development during this time, and its heyday during the 20's. A number of distinguished men in this field gave many years of devoted service to the hospital. The majority of them were trained by, or on the staff of, the Massachusetts Eye and Ear Infirmary. Among these were such men as Drs. D. Harold Walker, Harold Tobey, D. Crosby Greene, Lyman Richards who made numerous important contributions to the literature, and many others. One senior staff member, Dr. E. A. Meserve, quite literally gave his life. In the spring of 1930 while performing a mastoid operation, he pricked his finger with a needle and died of septicemia.

In 1924 Otolaryngology was declared to be a department of the Surgical Service and this relationship continued until 1955 when it was made a separate and distinct entity.

An Era of Accomplishment

During the 33 year period, from 1936 to 1969, more drastic and dramatic changes took place in

medicine than in all of the previous history of mankind. For those privileged to be associated with the hospital during this time it has been a stimulating experience to observe these events and to participate actively in some of them. It seems appropriate to mention some of these occurrences at this time. From just after the turn of the century and for almost 40 years, sometimes as many as 175 or more mastoid operations were performed here each year for acute surgical mastoiditis. Many of these patients were desperately ill with meningitis, septicemia, brain abscess or other complications of this dread condition. Little or nothing could be done to control these complications, and prior to May 5, 1937, all of the 53 patients admitted here during the previous decade with streptococcal meningitis, from whatever cause, had died of the disease. On that date a six-year-old girl, Pauline Murphy, was admitted with acute mastoiditis and streptococcal meningitis. A simple mastoid operation was done on the day of admission but in addition she was given Prontylin, one of the first sulfa drugs imported from Germany for experimental purposes. Polly survived and is alive and well today. This was the beginning of the antibiotic era. The number of patients with surgical mastoiditis dwindled rapidly after the early 1940's and it is now a condition that rarely occurs in practice.

This Service pioneered in the use of general anesthesia for patients undergoing foreign body removal from the upper air and food passages at a time when this was considered medical heresy. Prior to 1937 it had been the practice to restrain forcibly such patients, an action which often required the efforts of four or five strong adults. An instrument was then passed into the air or food passage and if the patient and operator were fortunate the foreign body was located and removed. Despite the skill of the endoscopist some patients died and many had to have tracheotomies done after the procedure, but still the practice continued. Since 1937 over 500 children have been subjected to foreign body removal from the air and food passages in this hospital under general anesthesia with no operative deaths and only one tracheotomy necessary post-operatively. General anesthesia is now used almost everywhere in nearly all endoscopic procedures in childhood.

Research Advances

During the late 1940's and early 1950's pioneering work in vascular surgery was being done here by Dr. Gross and his associates. Techniques of demonstrating vascular and other anomalies of the

upper food and air passages by the use of contrast material and x-ray studies were worked out and reported in various journals. An exhibit of these techniques from this service was awarded a gold medal at the Pan American Congress of Otolaryngology and Bronchoesophagology in Mexico City in 1954.

The detection and treatment of hemangioma of the larynx in infants was dealt with successfully in a series of patients where our mortality rate was 6 per cent in comparison with all patients reported in the literature where the mortality was 50 per cent. Our results were reported in the literature.

The transpalatal approach for repair of congenital atresia of the posterior nares was devised here independently and used for over 30 years. A large series of patients was reported in the medical literature from this Service.

Beginning in the late 1930's this Service pioneered in the use of supersaturated cold humidity rooms in the treatment of upper airway obstruction due to infection. The rooms were also found to be very useful for treating croup and various broncho-pulmonary problems, as well as for patients who were tracheotomized for one reason or another and for those who had endoscopic procedures. Today these rooms remain the most economical, effective and comfortable way of providing for these various problems an environment of supersaturated air.

In 1951 the first Hearing Clinic in New England, one of the first in the country for children, was established as part of this Service. The Clinic grew rapidly in size and importance and is now known as the Hearing and Speech Clinic.

The teaching of postgraduate students at the resident level has always been a concern of this Service but no regular program was in existence until 1955. At this time an affiliated residency training program with the Massachusetts Eye and Ear Infirmary went into effect. This has continued to

develop to the point where in 1967 two Massachusetts Eye and Ear Infirmary residents were on service throughout the year. The importance of the continued development of this program both to the Service and to the hospital is of the highest priority.

At the present time this is primarily a clinical service with a staff active in the care of patients and in postgraduate teaching. On a national level, Dr. Charles F. Ferguson, the most senior member on the Service in relation to time spent in service to the hospital, has been elected President of the American Broncho-Esophagological Association for 1969.

A Look Ahead

Today, as in most of the past since the early days of the hospital, we have been heavily involved in tonsil and adenoid surgery in children. This is one area in which the antimicrobial drugs have not been as dramatically effective as elsewhere. Bacterial diseases of the throat can be controlled by these drugs and acute conditions are dealt with successfully. However, frequently recurring infections associated with ear or other complications continue to be one of the outstanding problems of early childhood. When careful and conservative indications are adhered to, and the operations are performed under controlled conditions, the results are usually gratifying and sometimes dramatic. The need for these procedures will continue to exist until some more effective means for controlling bacterial and viral infections is discovered.

Although acute surgical mastoiditis has virtually been eliminated, there still exists a considerable and widespread problem related to malfunction of the Eustachian tube from various causes. Deafness or serious derangement of the middle ear sometimes requiring surgical operations can result from chronic inability to ventilate the middle ear. These throat and ear problems should be fruitful areas for future clinical and basic research efforts.

HEARING AND SPEECH DIVISION

Allan C. Goodman, Ph.D.

This is The Children's Hospital's Centennial Year; a time to look at the past, assess the present, and guess at the future. This is the Year of the Rooster in China, the year of student revolt in Paris, Tokyo, San Francisco, New York, Chicago, Waltham. This is the year that has just observed a turbulent break-down of communication around and at the Democratic National Convention in Chicago. This is the period dictionary writers will refer to in dating the expression "generation gap". This is the time future historians will describe as a period of impaired communication. The professional concern of the Hearing and Speech Division is with disorders of communication; different etiologies, perhaps, but communication disorders, nevertheless.

At the time of the founding of Children's, Alexander Graham Bell's most notable activities in the study of hearing and speech and the oral education of the deaf were centered in Boston. We in this Department are among the inheritors of his academic legacy, at the least as a result of his efforts which established the study of speech as a science. Sarah Fuller, the first principal of the Horace Mann School for the Deaf, also established in 1869, was a close associate of Bell. Both advocated early, pre-school, teaching of deaf children, a policy we firmly endorse and must still vigorously promote. Aided and influenced by these understanding and innovative personalities, Mrs. Francis Brooks established in 1888 the first school for deaf infants. The Sarah Fuller Home For Little Children Who Cannot Hear. This is today the Sarah Fuller Foundation for Little Deaf Children which affiliated in 1957 with Children's and is now an integral part of the Hearing and Speech Division.

While it would be interesting, it would be inappropriate for this report to present in any detail the history of hearing and speech sciences. We acknowledge our debt to Bell for his humane interest in, dedication to, and accomplishments for those with disordered communication. We recognize the academic inquiries he fostered directly or indirectly in many universities and medical centers which provide the heritage for the present day professions of speech pathology and audiology.

The origins of speech pathology and audiology at Children's are relatively recent. Briefly, Dr. William H. Ladd in Surgery and Dr. Harry W. Perkins in Dentistry recognized a need for speech therapy and in 1942 secured the services on a part-time basis of Mrs. Esther Shapiro. Dr. Paul Losch in Dentistry provided additional support and encouragement to this development. Mrs. Shapiro is still with us

as a specialist in children with cleft palate, and has the pleasure today of seeing the excellent results of her early efforts with many very young children now grown to maturity.

Established by Dr. Flake

Dr. Carlyle Flake, Otolaryngologist-in-Chief, with a great interest in hearing problems and aware of the contribution a hearing and speech group could provide for the Medical Center, established the Hearing and Speech Clinic in 1952 with Dr. Adam Sortini as director. The Clinic developed rapidly to a staff of ten.

When the present director assumed responsibility in the summer of 1962 the Department operated in two physical locations with three essentially autonomous units, a Hearing Clinic, a Speech Clinic, and the Sarah Fuller Foundation for pre-school deaf children. The principal changes which have taken place since then followed from the application of concepts and principles having to do with the unity of hearing, speech and language as an area of study:

First, the recognition that there is an essential unity in the study of hearing, speech and language functions and that there is a continuity between normal and abnormal;

Second, that disorders of communication are a complex function of physiological, anatomical, social, and psychological factors;

Third, that the approach to clinical problems should recognize that at any one time in the history of a profession the procedures are simply best approximations and represent no more than a *modus operandi* subject to question and change;

And fourth, that the most productive clinical orientation is eclectic and experimental.

Action on the basis of these concepts resulted in the development of a cohesive department over a period of four to five years. I am pleased and inspired by the knowledge, enthusiasm and dedication of the staff. They work effectively with their young patients, with the parents, with each other, and with staff in other departments. They have a common core of knowledge and skills but they show diversity, originality and versatility. All communicate with each other effectively.

The principal players, in order of appearance on the scene, are Mrs. Hellaine Nepo and Dr. Walter Cullinan. They joined the staff early in 1963 and added strength and stability to our efforts in speech pathology and education of the deaf. Dr. Cullinan has since left to join the staff of the University of

Oklahoma Medical Center. Dr. Paula Menyuk of Massachusetts Institute of Technology has been with us since 1964 as Research Consultant in Psycholinguistics. Mr. Richard Sweitzer, chief audiologist, assumed responsibility for an expanded service in audiology in 1966. Dr. Anthony Bashir, chief speech pathologist, has also been with us since 1966. Mr. Sweitzer and Dr. Bashir added considerable and important stability and their efforts have made much easier our continued growth. Dr. John Chaves became a member of the staff in October 1968. He is our first full-time research associate. This development marks the beginning of a major new period in our future course.

Our move to the Fegan Memorial Outpatient Center in the summer of 1967 was essential to improved functions and necessary growth. We had looked forward to the move with great anticipation and impatience. It was a most pleasant accomplishment. Great advantages accrued from this. For the three preceding years we had operated in four widely separated locations; that obviously did not promote easy communication or superior efficiency.

Aside from the much more pleasant atmosphere in the new building, we gained additional space which permitted the expansion necessary to meet the demands for service without increasing the length of the waiting list. Also important, our new spaces are designed for their functions and they work wonderfully well; sound-proof rooms, for example, are sound-proof. Perhaps most important, the move has given us the space and the equipment to begin our research program.

Our colleagues locally and elsewhere in the country tell us that we have established an enviable national reputation. I hope that is true, and that, in fact we merit the compliment.

Our next steps are to continue to improve the clinical programs, to make the research programs an enviable one and to expand it, and in the not very distant future to establish a strong academic program in audiology and speech sciences. These three goals are inter-related; the strength of each will affect the value of the others and the three together will enhance our contribution to the Medical Center and to the community at large.

DEPARTMENT OF PSYCHIATRY

George E. Gardner, Ph.D., M.D.

The Department of Psychiatry of The Children's Hospital Medical Center, established in 1953, was the first independent, autonomous Department of Child Psychiatry (co-equal administratively with the medical and surgical departments) to be established in a children's hospital in this country. This milestone has been of great importance both in the development of the psychiatric services within the hospital itself and also in respect to the development and growth of this specialty in children's health centers elsewhere.

Although the Department is the youngest of the hospital, it does not mean that an interest in and a concern for the emotional aspects of child development began in the hospital just 16 short years ago. Evidences of these interests and concerns on the part of the non-psychiatric specialists on the staff parallel in large measure those that constitute the historical past in the development of the specialty of child psychiatry itself. The delivery of psychiatric services began through the efforts of individual staff members in the Division of Neurology and in the Department of Medicine.

The late Dr. Bronson Crothers, for many years Chief of the Division of Neurology in the Department of Medicine, comes to mind immediately as foremost among the staff members who not only was interested in the psychiatric aspects of the practice of pediatrics but also contributed in an incisive and thoughtful way to the literature of the field. Long before World War II, in addition to establishing psychological test services, he also sought diagnostic and consultative help from the child psychiatry field. The first fully trained child psychiatrist and child psychoanalyst appointed to his staff was Dr. Lydia Dawes. Dr. Dawes began her work here in the early 1940's and is still on the staff as a very valuable instructor of our psychiatric residents.

Dr. Prugh Appointed

Following World War II, through the interest and efforts of Dr. Janeway, Dr. Dane Prugh was appointed to the staff on a full-time basis and the precursor of a relatively formal "Division of Psychiatry" was established within the Department of Medicine. Dr. Prugh and Dr. Dawes were for a time the sole psychiatric appointees of the Division. In addition to Dr. Prugh's clinical work with patients, it is to be noted that his published research reports at that time on the "Hospitalization of the Child" are still considered classics in the child psychiatry literature.

By 1949, Dr. Prugh had established training sequences in pediatric psychiatry that were open to

affiliating residents in child psychiatry from the already approved child psychiatry training centers in Boston — principally those from the Judge Baker Guidance Center then located at 38 Beacon Street in downtown Boston. However, in order to qualify the emerging Division as an approved training center for residents, he asked the Judge Baker to provide for him the professional, supervisory and training manpower necessary to effect this training status. In response to this request the Judge Baker in 1950 "lent" the hospital a part-time child psychiatric "team" — a child psychiatrist (Dr. Tully Benaron), a clinical child psychologist (Dr. Joseph Lord) and its Chief Psychiatric Social Worker (Mrs. Elizabeth Holmes Baldwin). Following the installation of this "borrowed" team, the Division was able then to secure training resources and stipends from the National Institute of Mental Health and to receive child psychiatry training approval from the American Association of Psychiatric Clinics for Children. At this point (1950) Mrs. Baldwin was replaced by Mrs. Margaret Rose as the social worker and Mrs. Rose, Dr. Benaron and Dr. Lord were appointed to the hospital staff and were supported by the hospital. Dr. Benaron continued thereafter with us and is at present the Senior Psychiatrist of the staff and Dr. Lord (also continuing) is the Chief Psychologist of the hospital. These were the meaningful beginnings of an affiliation of the Judge Baker Guidance Center and The Children's Hospital Medical Center.

An interesting quote from a recent overview statement by Dr. Benaron indicates the modest physical context in which the finally definitive Division of Child Psychiatry began its work in the hospital:

Our quarters at that time consisted of a little room, probably not more than about 10 x 10 feet at the end of a dingy corridor in the old Lab Building which has since been torn down, and this room was the entire Psychiatric quarters and it was shared by both Dane Prugh and his secretary. If one couldn't find a place to see a patient, for example on the ward, and rooms weren't available, you kindly asked the secretary (and Dane, if he were there) to vacate the room so that one could use it. The same thing held true for Dr. Lord when he had to do some testing and also for Mrs. Rose when she wished to interview a parent. Since then the Department has expanded to such an extent that I sometimes hold my breath in wonder how that fledgling has grown!

Judge Baker Affiliates

In 1953 the Judge Baker Guidance Center through Trustees' actions became an affiliate member of The Children's Hospital Medical Center and its Director became the Psychiatrist-in-Chief of the newly established Department of Psychiatry of the

Hospital. In the same year the Psychiatrist-in-Chief who was a Lecturer in Clinical Psychology in the Harvard Department of Social Relations was additionally appointed by the Board of Overseers as Clinical Professor of Psychiatry in the Harvard Medical School.

In 1957 the affiliated Judge Baker Guidance Center moved from Beacon Street into its new quarters across Longwood Avenue with its community-oriented out-patient division, its in-patient psychiatric wards and its experimental Manville Schools. Through its tunnel connection with The Children's Hospital Medical Center the collaborative psychiatric service, training and research potentials of the Department of Psychiatry of the Hospital were immeasurably enhanced.

These moves by the Boards of Trustees and the Harvard Faculties involved have made possible much of the expansion and the present comprehensiveness of the Department's clinical services to children and its multiple roles in teaching and training of undergraduate and post-graduate college, medical school and university medical and paramedical trainees. Finally, through these facilities and relationships set up in 1953, there is now no area of needed research in child development and child psychopathology that cannot be approached by members of the Department by virtue of the wide diversification of its own clinical cases or through its close and meaningful relationships with the Judge Baker and with other hospital and university departments.

Present Activities and Programs

From the modest beginnings outlined above, the Department has grown both in respect to the number of areas of coverage (clinics and wards) and also in respect to staff personnel.

At the present time (1969), the professional staff personnel comprise the following: 17 Staff Psychiatrists, 10 Clinical Psychologists and 10 Psychiatric Social Workers. In addition, there are 12 residents in child psychiatry, 15 trainees in clinical psychology and 4 students in social work.

The "clinical coverage" by Psychiatry now extends to practically every service, ward and clinic in the Hospital. Beginning at first with treatment and consultation work in the medical out-patient and in-patient service and on the general surgical wards, the service has expanded until at the present time all areas of the Hospital are covered by "team assignments," i.e., an assigned psychiatrist and psychologist on call for diagnosis, consultation or treatment of emotionally disturbed children. This "serv-

ice growth" throughout the years has been effected solely through (and only after) "invitation" from the other hospital services themselves. The only "problem" facing the Department of Psychiatry today is the fact that we just do not have enough psychiatry and psychology personnel to cover adequately the requests for services forwarded to the Department!

The activities and programs of the Department of the immediate past years and at the present time cover four main areas of effort:

- I. Clinical Psychiatric Services
- II. Training of Child Mental Health Personnel
- III. Education of Non-Psychiatric Medical and Non-Medical Personnel
- IV. Psychiatric, Psychological and Social Science Research

These areas will be dealt with, in turn, though Item III (Education of Non-Psychiatric Medical and Non-Medical Personnel) in the main will be covered in various of the other outlined sections which follow.

I. Clinical Psychiatric Services

1. Central Treatment Unit

The Central Treatment Unit of the Department (and the headquarters of the Department itself) are now housed on the 7th and 8th floors of the new Fannie Fegan Out-Patient Building. Whereas in previous years the Psychiatrist-in-Chief (together with other Chiefs of Service) rightfully may have complained about the physical aspects of the out-patient quarters in which his personnel had to work, such complaints are completely out of order today. The quarters in the Fegan Building are excellent both in spaciousness and in appointments. Of even greater importance to Department operations, it at last has a centralized "home."

At the present time over 200 children and their parents are in relatively intensive individual, family or group therapy in the Central Treatment Clinic. The referral sources from which these children come are the out-patient and in-patient services of the Hospital and from pediatricians, social agencies and schools in the community. It needs to be emphasized again that neither we in our clinic, nor we in association with all the other child psychiatry treatment services of the Boston community, can take care of the treatment needs of children who need psychiatric help. And in this matter we but reflect the unfulfilled needs of children for this care that exist throughout the country.

The psychiatric treatment of emotionally disturbed children — in any age category from the pre-

school age levels through adolescence — comprises a relatively long and time-consuming effort. This is particularly true due to the fact that the treatment of the individual child patient must of necessity include the treatment of the significant people in his family and, indeed, includes an evaluation of and perhaps an involvement in many other items in the child's environment. Wherever indicated (and possible) varied and shorter treatment procedures are instituted by our own clinic or through child-serving agencies beyond the Hospital. Yet in spite of the utilization of these outside agencies in a community or ecological approach to the problem, there are many emotionally disturbed and anxiety-ridden children for whom only an intensive individual psychotherapeutic approach offers hope for an amelioration or eradication of their difficulties. It is to the needs of these latter children that the professional resources of our Central Treatment Clinic are directed.

2. Out-Patient Clinic Services

The Out-Patient Consultation Service is a collaborative service involving the Department of Psychiatry and Psychology and Social Service in the diagnosis and consultation of children who are referred to the Out-Patient Department. This service is offered every clinic day.

There are nine staff psychiatrists who are involved in this work. Our goal in the area of patient care is in the first instance to provide consultation and diagnostic evaluation services to the Medical Out-Patient Department of the Children's Hospital. A second goal is to provide teaching and training for various levels of child psychiatry trainees, affiliate psychiatric trainees, psychology trainees, social work students, pediatricians at different stages of their professional training and nurses.

This consultation service function is carried out by an assigned psychiatrist, a second-year psychiatric resident and a social worker attending the Medical Out-Patient Department each morning. Any patient coming to the MOPD can be referred to them for diagnosis, or to help the medical resident understand any child's problem and to make suggestions relative to the care of, and planning for, the child. About four to six patients are seen each morning.

Additional out-patient consultation work takes place in the specialty clinics. These clinics are smaller and hence together with a more constant personnel one has a chance to develop more of an ongoing relationship with a small group of professional colleagues all working together to give comprehensive care to each individual child with his or

her very "specialized" disability.

A very important area of psychiatric consultation is the Medical Emergency Service. We see in consultation any patient who comes to Medical Emergency Clinic with a definite psychiatric problem or with a psychiatric problem associated with a medical disability.

In the fall of 1967 the new and very important Developmental Evaluation Clinic was established for the diagnosis and treatment of, and planning for, the mentally retarded child. From its beginning a fully trained child psychiatrist has worked as a member of the clinic team. In the psychiatric interviews with patients and their parents an added emphasis is put on exploring aspects of emotional life and adjustment of the child and the family that are so important in respect to all chronically handicapped children, e.g., the existence of guilt feelings in the parents, the tendencies to over-protection, the presence of probably unfulfilled hopes, the child's inability to participate in peer group activities and the need for the formulation of realistic educational goals and planning with the family, the schools and the community agencies to secure such specialized education. In a survey of the first 130 cases seen in the clinic, 11 percent had emotional difficulties as the main cause of referral and primary limiting factor in their adjustment; 25 percent exhibited some emotional and behavioral difficulties that played secondary roles but still needed specific intervention, and eight percent exhibited various forms of psychotic behavior. The establishment of this clinic adds greatly to the extension of the Department's service to children, to its training potential for child mental health trainees and to the possibilities for psychiatric and psychological research.

In the aggregate there are approximately 600 children seen in psychiatric consultation on the Medical Out-Patient Department in the course of a year, from 75 to 100 children are seen in the Medical Emergency Clinic, and approximately 120 are seen in the Developmental Evaluation Clinic. Many of these cases are seen again for a more detailed psychiatric diagnostic work-up and some are referred into the Central Psychiatric Clinic for treatment. It is our estimate that this out-patient psychiatric consultation clinic service probably excels — in respect to the number of patients and parents seen — any like clinic north of New York City.

The Medical Out-Patient Department, the Medical Emergency Clinic and the specialty clinics also constitute areas for valuable and effective teaching and training in child mental health care. Trainee groups receiving this instruction are (1) child psy-

chiatry residents, (2) affiliating general psychiatry residents, (3) psychology trainees, and (4) medical students. In addition, (5) nurses in the out-patient area are instructed through seminar teaching by one of our staff psychiatrists, the instruction relating to their roles in out-patient care and parent-child relationships.

3. *Psychiatric Service to Hospital In-Patients*

Although the hospital does not yet have a separate in-patient psychiatric service, a large percentage of the Psychiatry Department's time and effort is offered to the patients on each of the medical and surgical in-patient divisions. This service primarily is given in the form of consultation and diagnosis — but a very large amount of time is spent in actual psychiatric *treatment* of these children and in advising parents, or planning with parents, in respect to the future care of their child. This type of in-patient consultation service is carried out at the present time by assigned staff psychiatrists (and their assigned psychiatric residents) on ten different divisions of the Hospital.

A second structure utilized for psychiatric care designed for in-patients is the "Patient Progress Clinic." This clinic was set up two years ago to meet a need that had been long recognized by psychiatrists on the in-patient divisions, namely the need for follow-up of those cases that had been seen in consultation on the wards of the hospital for whom it appeared that out-patient attention (or perhaps "continuing contact") seemed desirable. These former in-patient children are diverse in their needs and some of them warrant traditional psychiatric attention but they live in communities in which such attention simply is not available. They are seen on a once-a-month basis and the main thrust of the follow-up appraisals is to continue to evaluate their suspected propensities for emotional or behavioral disorders and to advise their parents and advocate remedial or preventive measures that may be utilized to tide the child (or the family) over crises that may have arisen. It is important to note that the children returning to the Progress Clinic are followed in conjunction with the medical or surgical resident whose patient the child was during the hospital stay.

Psychiatric service to in-patients is offered to the patient himself or to the patient's family directly by the psychiatric consultant or indirectly by the child's house staff physician through consultation with the guidance from the psychiatrist. Not infrequently the work with the family members is carried out by the social service worker assigned to

the particular ward, again with psychiatric consultation.

The in-patient consultation service many times is extended beyond the hospital with advice and recommendations to the child's pediatrician or family physician in respect to utilizable agencies for the child's continuing care. The social agencies themselves or the schools in the child's community are also involved in the implementation of programs that may meet some of the patient's needs that were noted during his hospital stay.

Teaching and training are on-going and continuous in the work of the psychiatrists on the in-patient divisions, and include the medical and surgical residents, psychiatric (second-year) nurses, aides, occupational therapists, and the "Play Ladies" group.

An additional — and to us a very important — group to whom child psychiatric instruction is given are the Harvard Medical students. Their teaching can be divided into three areas. Firstly, we have those medical students in the Principle Clinical Year who are taking electives with us. Secondly, there are those medical students who as part of their assigned pediatric experience have patients whom we are asked to see in consultation. The third area is the regular Friday morning teaching conference that is held for the medical students again oriented around their medical material and oftentimes consultations will eventuate out of an informal discussion of these cases, the psychological aspects of which they had not fully appreciated prior to the classroom or ward teaching exercise.

Another area of teaching involving all of these groups is the "patient care rounds." These rounds held twice a week involve the participation of all of the professional personnel of the ward on which the patient is housed. They are devoted to a pooling and discussion of all the materials gleaned from studies and observations that bear upon the multiple aspects of the care and treatment (and milieu) of the patient.

One might be inclined, at first thought, to expect that a lesser interest in child psychiatry and in child mental health principles would be evidenced by physicians and residents on the surgical service of the hospital than those physicians on the medical service. It has been very gratifying (and illuminating, too!) for us in the Department of Psychiatry to note that at The Children's Hospital Medical Center this popular notion is just not so! From the very first days of the establishment of the Psychiatry Department in the Hospital the general surgical services have evinced an interest in the emotional

response of their child patients (and the parents) equal to the interests and concerns for these matters by their colleagues in pediatrics. The number of their referrals and requests for psychiatric consultation has always been high and their self-initiated requests for seminar instruction by the psychiatric staff all attest to the fact that our surgeons and the surgical residents are dedicated to the principle of comprehensive care for their patients.

II. Training Programs

1. Career Child Psychiatry

The program for the training of Career Child Psychiatrists is a two year program offered to those physicians who already have had a minimum of two years basic training in general psychiatry in a hospital accredited to give such training. The program at The Children's Hospital Medical Center is affiliated with the psychiatric resident program of the Massachusetts Mental Health Center. It is accredited for both career and rotational training in child psychiatry by the American Board of Psychiatry and Neurology and its sub-specialty Board in child psychiatry, and "approved" as a training clinic of the American Association of Psychiatric Clinics for Children. In addition, it is a unit of the teaching orbit in Psychiatry of the Harvard Medical School Department of Psychiatry.

The training program is a coordinated program offered in conjunction with the training functions of the Judge Baker Guidance Center. This coordination between the hospital department and the guidance center has greatly enriched the training program offered by our department, through the establishment and development of an in-patient division within the Judge Baker for adolescent patients (26 beds); the establishment and development of a Psychiatric Day Care Program in the Judge Baker's Manville Schools, and the addition of a day nursery for pre-school children.

Furthermore, a clearer differentiation of the "case types" of children with emotional and behavioral disabilities that are under the supervised care of our trainees has been possible. The hospital can provide an adequate number of children for psychiatric care and instruction who are suffering from psychosomatic problems, from associated illnesses and congenital defects, and from all of the physical disabilities of childhood; whereas the out-patient division of the Judge Baker receives on referral children from the Boston Metropolitan Community at large through referrals from various social agencies, schools, and juvenile courts. These differences in emphases of "case-types" accepted for

treatment in the two institutions enable us to present the trainee with the widest possible clinical experience in child (or, indeed, "family") psychiatry. As can be seen, the basic philosophy of the program is the felt necessity to offer to all of our trainees the widest possible variety of children's cases needing psychiatric consultation, diagnostic and treatment services.

The main emphases of "core content" of the training program of career child psychiatrists are, of course, intensive training relative to the diagnostic evaluation of emotionally disturbed children and upon the psychotherapeutic treatment of children and parents. Both of these aspects of training are carried out within—and with emphasis upon—the community context and relationships that impinge upon the developing child and his family members. (1) Training in diagnostic and consultation is carried out on both the Out-patient Division and the In-patient wards of the hospital under the supervision of staff training psychiatrists. (2) The training for psychodynamic understanding and for a sophistication relating to child personality tasks in development, their phases and possible resultant phases and disabilities, and training in individual psychotherapeutic techniques with children are carried out in the central treatment clinic—again under the supervision of trained child psychiatrists.

2. Pediatric Psychiatry

During the past six years we have had a training program for Board accredited or Board eligible pediatricians operating parallel to our definitive Child Psychiatry residency training program. From the very beginning our basic aims in this program have been to insist that these physicians retain their own professional identity (pediatrics) and, conversely, to have it clearly understood by them and by the training staff members of our own Department that we are not trying to make child psychiatrists out of them. In addition, we have stressed the importance of the use of facilities of the allied public and private health, education, welfare, family and the varied social service agencies, the role of the personnel of such agencies, and the criteria of selection of cases (and methods involved) for referral to them. In all of our training efforts we have tried to emphasize the importance of *prevention*—through early detection, early intervention and early re-referral when indicated.

This training program was generously supported by the US Public Health Service, National Institute of Mental Health, as are all of our other training programs.

3. Pediatric Residents

We have continued our educational and training program for the hospital's pediatricians, house officers and residents. As outlined above much of this is done in the out-patient division and in the various ward settings on both the medical and surgical units as informal, case-oriented bedside instruction. In addition, the Psychiatrist-in-Chief meets with the medical residents each Friday morning to discuss cases that seem to the pediatrician to have paramount or associated psychological problems. In these sessions the pediatricians present their own cases to the psychiatrist and he, together with two members of his senior staff, and a clinical psychologist, discuss the meanings of the symptoms, the indicated treatment or the disposition of the case in question. The primary aim of this seminar is the instruction of pediatric residents relative to those cases which will appear frequently in their future hospital or private practice, with the hope that they themselves can handle these cases without delayed and costly referral to the child psychiatrist. In short, it is our hope that the pediatrician will become an effective additional mental health arm in the community.

4. Clinical Psychology

The training of psychologists and the training done by psychologists have occurred in many different areas of The Children's Hospital Medical Center and, in turn, at several levels of training. The Psychology Unit Chief of MOPD implemented a plan in which he provides on-the-spot consultation for pediatricians with reference to diagnostic testing, and demonstrates, with the patient, screening testing techniques for subsequent use by the pediatrician. Two of our research personnel in the area of tasks of emotional development in children have conducted seminars for school personnel on this particular diagnostic technique.

In-service training for staff psychologists has been an on-going process. Beyond the teaching provided for all disciplines in the Department by way of regularly scheduled teaching and progress conferences, staff meetings, and evening scientific meetings, have been the special teaching exercises for staff psychologists. These have been accomplished primarily by regularly scheduled staff and supervisors' meetings.

Within the Department proper, psychologists have sponsored seminars on the theory, meanings, and use, of psychological tests for psychiatric residents, pediatric/psychiatric fellows, and for student psychiatric social workers.

Training programs for students in psychology have been a major function of staff psychologists, with allied professional personnel participating extensively. These programs have been implemented at undergraduate, doctoral, and, in conjunction with the Judge Baker Guidance Center, post-doctoral levels.

At the pre-internship level we have trained, each year, three to five candidates for doctorates in clinical psychology from the Department of Social Relations at Harvard University. These students spend the equivalent of half a day a week with us, as a supplement to a seminar on psychotherapy with children (taught by the Psychiatrist-in-Chief); and they are individually supervised by senior staff psychologists on their work with two child therapy patients. Through a special arrangement with the Harvard School of Education, one candidate for a doctorate in school psychology has been with us each year where he is supervised on his therapeutic work with children seen in a school setting.

The training program for pre-doctoral interns in psychology, in operation for many years, has received a major emphasis. The program, approved by the American Psychological Association and, for stipend support, by the United States Public Health Service, includes intensive experience in psychological testing of children; an introduction to psychotherapy and counseling with both children and their parents; and a survey of research findings and some exploration of research techniques. For the training year beginning in September, 1968 there were seven trainees. They have come from a range of universities, all of whose programs have been approved by the American Psychological Association.

Since 1962 a training program for *post-doctoral* students in clinical psychology has been conducted jointly with the Judge Baker Guidance Center. This program, one of the relatively few at the post-doctoral level approved and partially supported by the United States Public Health Service, is intended, by USPHS definition, for unusually superior candidates. In content it can supplement, in part, the pre-doctoral internship; however, the post-doctoral intern is given considerable latitude for specialization in particular areas of interest, whether it be in research, diagnostic evaluation, psychotherapy, residential treatment, etc. In addition to intensive individual and group supervision and attendance at the several departmental weekly teaching exercises, seminars, especially designed for this level of student, are held weekly. For the training year which began in September, 1968, there were two trainees.

Finally, we note the rich training opportunities

the Children's Hospital Medical Center offers for those trainees in psychology interested in working with children. The number of children referred here for evaluation through psychological tests by schools, family doctors, and pediatricians, increases annually. School psychologists, for example, have called on us where a pupil presented special diagnostic problems. While the increase in testing referrals over the years has presented problems in terms of service demands, it has provided enriched training opportunities for our trainees in psychology.

5. *Psychiatric Social Work*

Since the early beginnings the Department of Psychiatry has been involved in (1) the training of psychiatric social workers at the pre-master's level of social work education and in (2) the post-graduate advanced training and education of the social workers on the medical and surgical services of the Hospital.

In respect to the pre-graduate level we have participated in the education of social work students from the Schools of Social Service of Simmons College, Boston University and Boston College. This program includes week by week individual supervision of students in the work with individual patients (most often parents of our child patients) and through seminars with them relative to child development, child psychopathology and the principles of case work.

In-service training exercises and seminars in respect to child mental health are offered by Psychiatry Department staff members to social workers assigned to the various non-psychiatric services of the Hospital.

The training and education of social workers by the staff members of the Department of Psychiatry and of its Division of Child Clinical Psychology is by no means a "one-way street." For members of the Social Service Department as a whole — and particularly the social workers of the Psychiatry Department itself — make meaningful contributions to the education and training of our trainees in Child Psychiatry and in Clinical Psychology. Much of this "return-instruction" is done through their associated work with these disciplines in the diagnosis and treatment of patients as members of a clinical team; it is also carried out through formal instruction by them as to community agency functions and the desired relationships of the team members with the personnel of these outside child serving groups all in the interest of over-all better child mental health care.

III. Education Programs

It has been commented upon above that the Department of Psychiatry views as one of its major programs the education (as differentiated from professional *training*) of various disciplines who have a role to play in the delivery of better and more comprehensive services to children in child care functions and settings that may not be strictly psychiatric in nature. This instruction (formal and informal) includes such groups as pediatricians, medical students, nurses, and physiotherapists. Most of this instruction is offered in reference to clinical cases under care at the moment, though an appreciable amount is offered by the didactic seminars and lecture method. This is particularly true in respect to the teaching of medical students and nurses.

Two more items relative to our educational programs should be mentioned, one relating to the clinical clerkships for clinical psychologists and the other in reference to university course offerings.

1. An introductory educational experience is given to clinical psychologists in their third year of post-graduate training in the Department of Social Relations of Harvard University. These students actively participate in the treatment of cases under the direct supervision of four staff members of our Division of Psychology, and also receive instruction in the weekly teaching and progress conferences that are being carried out relative to all cases being treated by staff members in the Department.

2. In addition to the above, considerable didactic instruction is given in systematic academic courses in nearby colleges and universities. For example: The psychiatrist-in-chief offers one full-year course and two half-year courses to undergraduate and graduate students in the Social Relations Department in Harvard University and Radcliffe College. These courses deal with the psychological and social aspects of the practice of medicine, the emotional problems of childhood and adolescence, and the meaning, diagnosis and treatment of emotional disorder.

Three of our staff clinical psychologists are supervisors in the clinical clerkship course in the Department of Social Relations at Harvard: Miss Ethel Walsh, of our Division of Psychiatric Social Work, is an Associate Professor at the Simmons College Schools of Social Work; and three of her colleagues are supervisors of social work students from the Boston College, Boston University and Simmons College Schools of Social Work.

Finally, two of our staff members are faculty members of the Harvard Graduate School of Edu-

cation and give seminar and practicum instruction to those educators whose professions later will be that of school psychologist or school counselor.

IV. Research

As would be expected of staff members of a Department of Psychiatry in a large teaching hospital, almost all are involved in research — research recently completed, research in progress. A portion of this research is "clinical" research, an appreciable amount of it is basic in that it relates to investigations relative to selected aspects of child development. A necessarily brief overview of these research programs and projects should be cited.

1. Drs. Haskel Cohen and Geraldine Rickard are now completing a ten year normative study of the emotional development of children of latency age. This research was made possible in its pilot stages by grants from the Wolbach Fund and the Hood Foundation, and subsequently through support from the National Association for Mental Health. They have had two goals: the development of normative data on the emotional development of children; and the construction of a test which would lend itself to the collection of data which could be objectified so that children could be compared with one another more accurately.

Their development of the Tasks of Emotional Development Test as an instrument to provide normative data is based on the concept that the ability to function as a contributing, mature adult in a democratic society presupposes that children, in the process of growing up, will have solved at least at a minimal level, certain "emotional development tasks." One can assume that personality development takes place through the mastery of a series of tasks of emotional development and that certain of these tasks are more closely related to one of the three age-level periods, categorized as pre-school, latency (age 6 to 11), and adolescence. If a child has not been successful in mastering any given task of emotional development, there will be possible impairment in solving other tasks that come developmentally at the same age as well as impairment of tasks that come at a later age. The utilization of the developmental-task approach is one way to evaluate the emotional health of a child. While still in the stage of "construction" by Drs. Rickard and Cohen their test instrument has been used with valuable results by many clinics throughout the country.

2. Drs. Nancy Rollins, Amelia Blackwell and John Blitzer have continued their intensive single case studies of the emotional and psychological

factors present in cases of anorexia nervosa, a condition wherein the child loses all interest in (or abhorrence of) the intake of food. In many instances the restriction of the intake of those food elements essential to life places the child in imminent danger of death. All cases demonstrating this severe disability (of still complex and unknown etiology) that come to the hospital are added to their growing series of individual case studies and the results of their published observations continue to clarify the emotional factors that are of salient importance in such cases.

3. Dr. Richard Galdston continues his studies and publications in clinical research in respect to the "battered child." He also has gathered material and reported upon his study of over 100 cases of burns in children — material gathered in the past five years on the surgical services. In association with a Harvard Medical student he has completed a study of the effects of cardiac catheterization upon the psychic functioning of children as reflected in their drawings and collaborated with a student in clinical psychology in a study of the psychological factors present in cases of ulcerative colitis. At the present time he has two studies in progress with collaborators from the nursing service, one in respect to the incidence of pregnancy in post-operative adult cardiac cases and a second relating to the varying incidence of deaths at various times of the year.

4. Dr. Stanley Walzer's research is directed at variations in behavior in children with sex chromosome abnormalities.

The research aims in this study are to relate the relatively new areas of behavior genetics to problems in normal human development and psychopathology. Little is known about the biologic contribution to those aspects of behavior which differentiate boys from girls. The sensible psychiatric, medical and surgical management of individuals with chromosomal, physical and psychologic ambiguity in their sexual identity requires greater theoretical knowledge about the relative importance of social and genetic influences in determining sex-identity and sex specific behavioral characteristics of an individual. By comparing behavioral observations in normal male and female infants and children with those obtained on infants and children with sex-chromosome aberrations, we hope to isolate behavioral characteristics having their origin in basic biologic processes. By gaining a further understanding about innate determiners of sex specific characteristics, we can see more clearly the limits which ontogenic experiences can have

on gender role patterning.

Recent investigations have emphasized the frequency with which severe psychopathology of a sexual or aggressive nature is found in individuals with one of the more common sex chromosome aneuploidies (XXY, XYY). Although the mechanisms involved in this relationship remain vague, further study of the nature of such correlations may lead to a greater understanding of the origins of sexual psychopathology in general.

Infants with sex chromosome abnormalities are being located through a mass chromosomal survey of normal-appearing newborns in a local hospital. Utilizing three drops of heel prick blood for chromosome culture and a newly developed method for analyzing and establishing the karyotype, over 3000 infants have been examined to date. About 0.8 percent of these phenotypically normal newborns have been shown to have a major chromosomal variation of some sort. Five infants with sex-chromosome aneuploidy have been found and are being followed closely in a long-term longitudinal study of their development. Adult patients having both chromosomal and psychosexual ambiguity have been located and studied closely.

Normal boys and girls two to three years of age are being studied in order to develop a taxonomy of sex differential behaviors in a variety of areas. Behavior so defined will be compared to that shown in infants with sex chromosome abnormalities in the hopes of isolating behavioral characteristics having their origins in biologic processes.

5. On the assumption that temporal organization is a behavioral dimension of major significance for developmental theory which also has broad clinical implications, Dr. Peter Wolff and his research colleagues have in the past year begun a series of studies on the role of simple rhythms in the organization of sensory-motor skills:

The sucking patterns of normal infants, of infants with the history of perinatal distress but no obvious neurological signs, and of infants with a variety of gross neurological or other systemic disturbances, were analyzed and compared. Our results to date indicate that the non-nutritive sucking pattern of normal infants has a remarkably stable temporal organization, and that "suspect" babies as well as grossly abnormal babies show significant deviations from the normal pattern. Work is continuing to establish the reliability of the sucking pattern as an index of perinatal distress, and to establish its validity as a predictor for later neuro-psychological disturbances.

In parallel studies the sucking patterns of infant

mammals have been analyzed as a baseline for experimental replication in animal infants of clinical conditions in the human, and for experimental modifications in the temporal organization of sucking. Species differ significantly with respect to rates of sucking; and all mammals (including the large apes) suck according to a pattern which is qualitatively distinct from that of human infants.

Our descriptive study of stereotypic motor patterns (blindisms, autisms, rocking behavior, of institutionalized children, of mental defectives and senile patients) as well as of stereotypic behavior in cage-isolated primates is continuing. The goal of these studies is to define the etiological and functional significance of stereotypic motor behavior whose temporal organization is primates including man has many common features, although the casual conditions for such behavior may vary greatly. Despite many theoretical speculations concerning the significance of stereotypic behavior, no formulation adequately accounts at present for its various manifest forms.

Our study of the clinical significance of choreiform movements (a "soft" neurological sign) in normal and psychiatrically deviant populations was extended. We were able to demonstrate that in a group of normal school children those with choreiform movements have significantly greater incidence of behavior disturbances in the classroom than normal children; and that adolescent boys and girls with choreiform movements perform less adequately in simple rhythm tasks of motor coordination than those without these movements. (See below) Of greatest interest to us was the difference in clinical significance of choreiform movements among boys and girls, with respect to the behavioral criteria indicated above.

A major effort is now devoted to the study of voluntary motor rhythms of older children — in this case, the ability to maintain a steady peak — peak rate when tapping on two telegraph keys, alternating the left and right hands. Dr. Irving Hurwitz and Dr. Wolff have analyzed children's performance in various permutations of a simple tapping test (with and without external entraining rhythms), and have begun to specify developmental norms from 5-14 years, to investigate sex differences in performance at different ages, to compare the performance of normal school children with that of children who have signs of minor neurological disturbances, specific learning difficulties and psychiatric syndromes. The correlation between tapping performance on one hand, and "soft neurological signs," competence in simple

cognitive tasks requiring rapid repetitive performance, reading ability, estimation and space conception on the other, are being studied. Preliminary findings indicate that the temporal organizational behavior, as defined by these tests, is a sensitive indicator of disturbances in motor and cognitive performance, which may in turn be associated with disturbances of social adaptation, including psychiatric disorders.

During the past two summers a medical student, Mr. Richard Ferber, and Dr. Wolff have investigated the effects of "white noise" on crying behavior and on the state of the infant. In addition, the natural history of cry vocalizations in the premature infant from 29-37 weeks was described. Vocalization patterns were visualized in sound spectrograms and sound pressure curves, for the analysis of temporal patterns.

In collaboration with Dr. Philip Liebermann of the University of Connecticut and his associates, Dr. Wolff has compared the sound spectrographs of normal newborn infants with those of non-human primates. The comparison indicates that the human infant, like non-human primates, does not have the range of sounds typical of adult human speech and that this lack is due to the vocal track configuration of the immature organism rather than to experiential factors.

Dr. Stephen Jaffe is studying developmental changes in the occurrence of "spontaneous discharge behavior" (spontaneous startles, rhythmical mouthing, etc., in sleep) in full-term newborns over the first seven days, in prematures until they reach full-term, and in post-mature infants. The effort here is to replicate previous findings in more detail and to investigate whether the gradual reduction in the rate of such "spontaneous discharge behaviors" is a function of "experience" or "maturation."

Dr. Shera Samaraweere and Dr. Kyu Won Lee completed a preliminary study of mother-infant transactions, based on the analysis of movement patterns of infants and mothers. In this pilot study, they have codified a notation system which describes the "quality" of movements during such transactions, and appears to be a reliable instrument for recording individual and group differences of mother-infant couples in quantitative terms. We now hope to apply the same methods for a cross-cultural comparison of child-rearing practices.

In collaboration with the Department of Cardiology at The Children's Hospital Medical Center, Dr. Annette Silbert and her assistant are making psychological assessments of a large number of adolescents with congenital heart disease. This is part of a larger

project pertaining to the physiological and psychological competence of these children to become gainfully employed.

During the past year, Dr. Silbert also collaborated on a study in which the neuropsychological status of children with noncyanotic and cyanotic congenital heart disease were compared. Children with cyanotic congenital heart disease were found to have significantly more difficulties in gross motor coordination and perceptual motor skills than the comparable group of children with non-cyanotic congenital heart disease.

Finally, in respect to these various studies under Dr. Wolff's supervision, Dr. A. Rosenthal and Dr. Ruth Hisenberg are now studying the psychological reaction of children undergoing cardiac catheterization. The aim of the study is to predict which children are likely to have serious adverse psychological results from the procedure, and to find ways in which psychological distress may be alleviated when the procedure itself is obligatory.

The Future

A final item for consideration in this report is the future of the structure and functions of the Department of Psychiatry of The Children's Hospital Medical Center. If the future were limited only by specific needs to be met within the hospital they could be itemized easily by stating that we desperately need more professional mental health manpower to take care of the requests made upon us for diagnostic, consultative and treatment services at this very moment; that we needed more space for professional staff and student personnel; that we need a definitive in-patient service for psychiatric cases. All of these needs insistently confront us in our daily work and presumably they will be met in the not too distant future.

But the future of our department, to my mind, is not to be gauged by these items of immediacy and proximity alone. Child psychiatry as a branch of medicine is a part of the newer developments in respect to the delivery of mental health services to the nation as a whole, and these newer developments in the form of community mental health centers will have their effects upon the service, training and research programs that we envision for the future.

However, when viewed from another angle, that is, from the angle posited by the fact that we are a department in a large teaching and research hospital, a different emphasis in function may emerge as the thrust of the future. I prefer to view our future in the light of this context as a medical

school and university-affiliated training-research center concerned with child mental health.

Hence, if it is true that predictions of possible advances and changes in emphasis are best based upon *research programs* being carried out by highly motivated investigators, it is also true that scientific advances specifically in the health field are equally best made by investigators working together at the peripheries of two or more scientific areas. New knowledge — and indeed new professional specializations and disciplines — emerge through the insightful detection and the meaningful resolution of the similarities and differences in two highly related adjacent bodies of knowledge. This “peripheralization” of scientific advances can be illustrated by such hyphenations as bio-chemistry, psycho-physiology, psycho-pharmacology, and a host of other relatively new disciplines.

Advances Predicted

Looking now at the present-day child mental health research field with this model in mind, one can make conservative predictions of advances in the next decade — and in respect to almost (not quite!) all of them, they could be forthcoming from the Longwood Avenue-Fenwood Road area. In citing these areas I hope it is both right and helpful to cite the names of the investigators themselves.

1. The first field is that of genetics. It has long been felt by many in the child health field that there was a genetic determination or at least a genetic establishment of vulnerability to our most serious psychiatric disability in childhood — the infantile psychoses — specifically autism and childhood schizophrenia. It is also held by many that the very subtle — but extremely important for mental health — variations in sexual identification possibly have their bases in certain genetic patterns. At the Children's Hospital, at the moment, a trained child psychiatrist, Dr. Santley Walzer, works in association with Dr. Park Gerald on problems that have more than an indirect relevance to these two problems. Needless to say, demonstration of facts relative thereto will open up the whole area of possibly altering these disabling developmental sequences or controlling their emergence through sound genetic counseling.

2. Unfortunately, in respect to the schizophrenias of infancy and childhood, in which we are vitally interested, the differentiating blood factors noted by present-day investigators of adult schizophrenia are not present in the blood of autistic children. Yet this very difference may be of great heuristic importance and lead to hypotheses of

value leading to eventual solutions in respect to both the child and adult types of this devastating psychosis.

3. Research relative to other items — and on another front, that of the effect of the *experiential* factors of importance in the emergence of the schizophrenic patterns of response — is in progress at The Children's Hospital Medical Center. Although it is far from being demonstrated that the *condition* the “Autistic Child” can be induced by experiential factors, it is a fact observed by all pediatricians and child psychiatrists that crucial disabling autisms are seemingly creatable by extreme emotional deprivation and marked isolation of the child in infancy — or through sensory input deprivation in blind or deaf children. Drs. David Ricks and Gene Nameche and their collaborators at the Judge Baker for the past five years have found (and located as adults) from our 18,000 case records more than 200 children who *were*, or who were *not*, diagnosed as schizophrenic in early childhood and who later received a definite diagnosis of schizophrenia in adolescence or adulthood and were hospitalized. These histories and examinations, together with the later hospital histories and actual follow-up interviews with these patients (and their relatives) 15 or 20 years later should give us greater and more accurate insights to the experiential factors — and particularly child-rearing practices of the parents — than ever we had before. The traumas, the crises, the successes and failures at varying critical periods or stages of development and their effects in a statistically significant number of cases of later schizophrenics could lead to very important suggestions relating to care and possible prevention or drastic modification of behavioral deviances and developmental arrests in the children of the future whom we will *know* to be (or can sensibly *assume* to be) vulnerable to that urge to the incapacitating withdrawal from reality that is the hallmark of the disease.

Developing Baseline Data

But our research in child development — and the allowable predictions that can be based thereon — are not confined solely to developmental and follow-up studies in respect to the schizophrenias and other serious behavioral deviances. For although the milestones in physical growth and development are easier to assess and hence have been fairly well worked out in references to specific chronological age levels, our developmental data in respect to the parameters of emotional responses and personality development have not. Through the on-going researches of Dr. Peter Wolff in the former and of Drs.

Rickard and Cohen in the latter which have been mentioned above, we will have as baseline data those developmental points and sequences that will be far, far more accurate than those with which we have had to work in clinical diagnosis, in prognosis of later development, and in the elaboration of salutatory milieu, remedial and rehabilitative contents and schedules in treatment. We will be able to locate with much more certainty time-wise (and estimate the age-in-months duration) those critical developmental periods which must be seized upon and utilized by parental, social and cultural feedbacks in infancy and at the pre-school age, or the later developmental stages and tasks will be all the more difficult — or even impossible — of successful solution. Our present-day milestones in respect to the complexities and variables involved in the *personality* development of the child are relatively hazy and sophisticated best guesses and hunches; they will be replaced through the research of the immediate future by accurate scales and measures of emotional maturity.

But, in addition, the trained child psychiatrist of the future, with his colleagues in the disciplines of clinical child psychology, neuropsychology and educational psychology, will no longer confine his attention to the affective, personality or emotional development of the child. He will concern himself increasingly with the effect of these upon the cognitive aspects of development of the child, with precision school learning, with the learning disabilities, and with the all-important developmental parameter of word-usage sequences and the complex stages of growth in thinking extending from the levels of primitive egocentric styles of mentation and communication in the infant to the attainment of proficiency in symbolic abstract and metaphorical thought as an adolescent and adult.

To my mind, there is no more widespread — and no more crippling — immaturation or developmental failure in otherwise completely “normal” or “superior” children in this country today than that of a precision learning disability based upon the extremely complex childhood task of comprehending and successfully using those signifiers or symbols of reality known as words, letters and numbers. There are extant to the moment many well-defined theories relating to the occurrence of this extremely disabling phenomenon and many different remedial approaches to overcome the resultant disability — but none of the etiological notions can be documented and demonstrated in all cases and none of the remedial approaches will prove efficacious in all cases. Needless to say, a precise and critically

differentiating typology is of first importance in this area and it will have to be worked out with all its accruing diagnostic, prognostic and treatment benefits in the immediate years ahead.

The Value of Collaboration

It is to the solution of these problems that Dr. Bessie Sperry and her associated investigators have turned their attention in our affiliated psychoeducational laboratory that includes both the Upper and Lower Manville Schools at the Judge Baker. It is in this particular area that one notes a good example of the value of the collaboration of various disciplines with their own differing but highly related bodies of knowledge that I cited above as necessary for the advance of knowledge in the child health area — regardless of the specific problem posited for solution. For attacking this particular problem of educational deficits are professionals acting as a team but trained in the differing disciplines of clinical child psychology, child psychiatry, neuropsychology, education and linguistics. And in passing — again in reference to my opening paragraphs — it is interesting to note here the possible emergence of two new disciplines — that of “Clinical Educational Psychology” and that of “Clinical Linguistics.”

It can be added also that it is this group of investigators who are challenged by the problem of educational retardation who welcome most of all — and hope to work with and gain immeasurably from — the clinical and research personnel located in our new Developmental Evaluation Clinic that deals with the problems of the mentally retarded child. The prediction of significant advances in our knowledge in both of these areas of disability is an expectation we have every right to entertain.

We have every right to expect also that great strides forward will be taken in the immediate future perforce of the joint efforts of investigators in the fields of child psychiatry, experimental and clinical psychology, and pharmacology. Investigators in Dr. Farber's laboratory and in laboratories of at least two Departments of the Harvard Medical School (Pharmacology and Psychiatry) give promise of additions in the form of efficacious drugs for the treatment of emotional disturbances in children. Thus far drug therapy, though of marked success in amelioration or arrest of some of these conditions in the adult, has not proved as helpful as we would hope in the children's field. But with a demonstrable breakthrough in respect to personality deviances in adults, may we not predict with assurance marked advances in drug therapy applicable

to the *child* that already demonstrates the anlage — or those segments of deviant behaviors — that reasonably may be thought of as the probable harbingers of disastrous adult life pattern disasters to ensue? I feel quite certain that drugs of proven positive effects will soon be available to us.

Prevention and Delivery

Finally, it is the collaborative efforts of psychiatry and the social sciences — notably sociology — that have inspired and forwarded two very important developments in the field of mental health that should go far to strengthen and implement our future research and treatment efforts in the child mental health field and, in turn effect changes in our training programs. The first item relates to possible primary and secondary *preventive* measures to be taken, and the second refers to the adequate *delivery* of mental health services to those people who need them most but who are unsophisticated or are reluctant to the end that they cannot (or do not) avail themselves of the help we have to offer them and to their children.

1. In regard to prevention, a growing emphasis is now placed on the ill effects of negative or harmful social and economic factors upon the mental and emotional development of children and hence upon their total mentally healthful adjustment both in infancy and childhood and in later adulthood. The deleterious effects of poverty, of cultural and informational deprivation (i.e., lacks in “feedback” stimulations to growth), the lacks in achievement motivations based thereon and the existent social and economic inequities that make it impossible to take advantage of opportunities for ensuring sound mental health development (emotional and cognitive) — all of these items are the research concerns of staff members of the Children’s Hospital Medical Center — notably in the studies of Drs. Richard Galdston and Dexter Bullard, those of Dr. Sperry’s group mentioned above, and the South End Service and Training Group working under the direction of Dr. Irving Hurwitz at the Judge Baker. All of these studies aim at early detection and amelioration of what seem to be possible causes of maladjustment as they exist in certain disadvantaged groups in our society — and in respect to them early intervention with prevention is the hoped-for goal.

2. Again, largely due to sociologically based researches and influences, there is a definite emphasis upon the *family* (rather than the single, individual child) as the sensible “unit as a whole” toward which we should direct our psychothera-

peutic endeavors. Family unit interviewing for diagnosis, for evaluation and for therapy is now in use on both sides of Longwood Avenue and evaluations of the results of it are under study. It would seem, on the basis of our initial application of this type of therapy that it *is* useful — and particularly is it informative in the diagnosis of child problems that seem to stem from marked faults, lacks or distortions in intrafamilial communication. That this “family approach” will completely replace the *individual* treatment of children — the hopes of some of its most enthusiastic supporters — is a suggestion probably without justification. But I feel that our evaluations of this method will indicate the effective utilization of it and the necessary *balance* between its use and the use of intensive individual psychotherapy in those cases illustrative of discrete well-initiated and classifiable childhood neuroses and disabilities.

3. Finally, our studies at the periphery of the mental health disciplines and sociology have indicated that the *delivery* of mental health services must be altered to the degree that such services will be brought into the community where they are needed most, and thereby be the more universally utilized by (and in part be structured by) those people in our society who the most need psychiatric help. This is basically (but in brief) the essence of the new movements resulting in the establishment of “Comprehensive Community Mental Health Centers.” All sections of the psychiatric and allied mental health service personnel of The Children’s Hospital Medical Center subscribe to these newer emphases and expect to play their part in the “satellite clinics” and “catchment areas” established as purveyors of these expanding services into the outside community. All of these efforts will, we are sure, better the mental health of the children in our finally selected community areas of choice. We of necessity, however, remind ourselves that the “community” of The Children’s Hospital Medical Center itself — and specifically all the medical and surgical services that comprise it — is in large part a veritable “community” in and of itself — a community, incidentally, that even now calls upon us for mental health consultative, diagnostic and treatment service that we just cannot — with our professional personnel resources — deliver to the extent and to the degree that we ourselves would consider to be adequate and sufficient coverage. From existing requests from our medical and surgical colleagues arises the structure known as the “waiting list” — a structure that by its length and its comprised unmet needs weighs heavily upon our De-

partment's collective conscience.

In conclusion, I should add that throughout the writing of this review of possible exciting discoveries of the future decade in respect to child mental health, I am repeatedly reminded of a remark made to me by Dr. Alan Gregg of the Rockefeller Foundation about 25 years ago: "The laboratories of the world will never rest until they have conquered neoplastic disease and mental disease, and I am not sure but that there is an important basic relationship between the two." It is upon this obvious determination of research personnel among

us (and elsewhere), upon the acceleration of their endeavors through multi-disciplinary approaches and upon the continuing dedication of highly placed men in government to give these investigators the support they need — upon these items rests the optimism that threads our predictions and augurs well that our hopes will in large part be realized in respect to the mental and behavioral disorders of children (and adults) by the end of the forthcoming decade. In short, if I may "opposite" a quote well known to all of us, "Here" — in these items — "is the summer of our contentedness!"

DEPARTMENT OF RADIOLOGY

Edward B. D. Neuhauser, M.D.

As The Children's Hospital approaches its centenary year, the Department of Radiology celebrates its 66th year. Only eight years following the report of Dr. Conrad Roentgen of the electromagnetic radiation that later came to be called X-rays, or Roentgen Rays, Dr. Percy Brown became, in 1903, the first full-time Radiologist to The Children's Hospital. Both he and Dr. Ariel George, who succeeded to the position, in 1906, not knowing of the extreme hazard of excessive exposure to X-ray, sustained damage that contributed to their demise.

The importance of the use of X-ray examination, in Pediatric practice, led to an exhibit of lesions and abnormalities in children shown at the meeting of the American Medical Association, in 1906. The work of the department grew rapidly, so that by 1909 over 2300 films were exposed.

Evidently, no one was more impressed by the value of X-ray examination than Dr. Thomas Morgan Rotch, Professor of Pediatrics, at Harvard University, who, in 1910, published the first textbook on Pediatric Radiology. This was entitled "Living Anatomy and Pathology: The Diagnosis of Diseases in Early Life of the Roentgen Method". He did exhibit the grace to state in the preface that "The plates of the Roentgen illustrations were taken by Dr. Ariel W. George, and, in their unusual excellence speak for themselves. To Dr. George, I can only express my appreciation of his skill and the ever new light, which he has thrown upon a somewhat difficult subject by his clear and original interpretation". The book was a most important contribution of its time, but Dr. Rotch gained little credit for it, and Dr. George much esteem.

Since those days, the contributions of the Department have continued. Dr. George Holmes, Dr. Edward Vogt, Dr. George Wyatt and many others have served the cause of the sick and injured child, demonstrating the way to the development of a department, which is all but unique among Pediatric hospitals.

The appended statistics show the continuing increase in the activities of the Department, and these have necessitated increase in Staff at all levels. Dr. Robert Wilkinson has joined the permanent Staff, as Assistant Radiologist in general diagnosis, while Dr. Robert Nebesar has come to The Children's to devote his full attention to Cardiovascular Radiology. He brings to the Department special skills in Vascular Radiology, and great experience gained while Vascular Radiologist to the Massachusetts General Hospital. In addition, Dr. Anthony Carter came to us for one year, from the Hospital For Sick

Children, Great Osmond Street, London, to initiate the program as the first full-time Pediatric Neuroradiologist. During his tenure, Dr. Roy Strand was continuing his training in Pediatric Neuroradiology, at Great Ormond Street, and at the Ulleval Hospital, in Oslo. Dr. Strand returned in July, 1968 to assume a permanent appointment as Neuroradiologist.

It now seems clear that all of Radiology has entered a new era of increased activity with the ability to demonstrate the vascular structures of almost any portion of the body by catheterization and injection of contrast material, and it is, indeed, a new and exciting prospect, but such procedures may be long and time consuming. An examination of two to three hours is not unusual, and the demand increases. One or several rooms of the Department may be occupied throughout a major portion of the day, diminishing still further the rooms available for the increasing bulk of simple routine work.

Activity Brings Changes

With the increasing activity and complexity of the X-ray Department, it was thought that the addition of an Administrative Assistant to the Radiologists would relieve them of many administrative duties and the Department was fortunate to obtain, as its first Administrative Assistant, a brilliant young woman, Miss Susan Walsh. With a happy combination of charm, tact and ability, she accomplished many improvements in the Department, and to name but a few: complete revision of the filing system, with color coding, and the most difficult task of converting the old system of X-ray numbers to a unit record system, so that now X-rays bear the same number as the patient's record.

Miss Cecilie Godderidge has relinquished her position as Chief Radiologic Technician to institute and organize a School of X-ray Technology. Miss Sandra Clarke has assumed the duties of Chief Radiographer with the assistance of Miss Roberta Kelly.

The Engineering Division of the Department continues under the able leadership of Mr. Eric Hammond. He, Mr. Charles Spear and Mr. Hernan Machicado have continued to solve many of the mechanical and electrical problems of this complex Department, some before they happen, but all afterwards. Perhaps their most important contribution has been the creation of a mock X-ray room in the machine shop of the Department, in the basement of the hospital, so that preinstallation of new equipment can be carried out. The X-ray De-

partment is too busy, too limited in its facilities to close a room for the necessary five, six or more weeks to install new equipment by the usual method of the X-ray companies, but by utilizing the mock-up room with preinstallation, a record has been established of a room installation in six days.

The Department is grateful to the numerous residents, who have served with distinction, and, who have gone on to occupy positions of importance in this country and abroad. The number of residents necessary to carry out the functions of the department has increased, in step with the workload, and as important, with the spread of the increased workload throughout the week. It is of interest that the workload on Saturday afternoon is often greater than on Saturday morning and it is not unusual on Sunday for the department to examine 40 or 50 patients. Many new technicians were necessary to accomplish this increased obligation and the technician coverage is now supplied

twenty-four hours of the day, every day. The technician, too, deserves much praise for their loyalty to the department, their cheerfulness under stress and above all, their understanding care of the sick children with whom they have to deal.

One would like to close on an altogether cheery note, but this in the present situation is not feasible, as the department has become thoroughly overburdened with work; a service load that, if continued, indicates a real decline in academic stature, so that, unless space, and increased medical personnel is soon found for the Department, its position of eminence cannot be long maintained. This is most true of the Department of Radiation Therapy and Nuclear Medicine, where crowding and lack of work space is almost unbelievable in a hospital that is proud of its reputation. The hospital must boast of its areas of excellence, but it must not obscure its many areas of deficiency.

Summary of Statistics
Department of Radiology
Year Ending September 30, 1968

	Diagnostic	Treat-	Isotope
Films	Cases	ments	Scans
145,005	55,166	5,430	1,269

Summary Statistics
Department of Radiology
Year Ending September 30, 1967

	Diagnostic	Treat-	Isotope
Films	Cases	ments	Scans
141,969	47,674	5,116	1,226

Department of Radiology
Residents

Dr. Robert Nebesar, April, 1967 to present
Dr. Gulab Shah, Jan. 1, 1968 to Dec., 1968
Dr. Simon Slasky, Jan. 1, 1968 to Sept., 1968
Dr. Anatole Pellizetti, Jan. 1, 1968 to March, 1968
Dr. Christian Belcourt, Jan., 1967 to June, 1968
Dr. Jack McAuley, Jan. 1, 1968 to June 30, 1968
Dr. Michael Grunebaum, July 1, 1967 to Dec., 1968
Dr. Neal Chandler, April, 1968 to June, 1968
Dr. Paddy Taber, July, 1968 to June, 1969
Dr. Detlef A. May, July, 1968 to June, 1969
Dr. Gilles Perrault, July, 1968 to June, 1969
Dr. John Keefe, July, 1968 to Sept., 1968
Dr. Peter Attwood, July, 1968 to Oct., 1968
Dr. Gerard Moskowitz, July, 1968 to Dec., 1968
Dr. Harry Russell, Oct., 1968 to present

DEPARTMENT OF SURGERY

M. Judah Folkman, M.D.

Surgeons have played a major role in the history of The Children's Hospital Medical Center since the founding of the institution, for it was a surgeon, Dr. Francis Henry Brown, who first proposed that a hospital for children be established in Boston. He and Dr. Samuel Langmaid were the first surgeons on the staff.

In 1903 it was agreed that chiefs of the surgical, medical, orthopedic, and pathology services also hold appointments at the Harvard Medical School. In 1906 Dr. James Stone joined the hospital staff and became the first recorded Chief of Surgical Services. He concomitantly held an appointment as Instructor of Surgery at the Harvard Medical School.

Following Dr. Stone's resignation in 1927, Dr. William E. Ladd was appointed Surgeon-in-Chief and Assistant Professor of Surgery at the Harvard Medical School. Although Dr. Ladd had previously practiced general surgery primarily at the Boston City Hospital, it is said that he was moved to devote his life to surgery of children after he witnessed so many hundreds of injured children following the explosion of a war-transport ship in Halifax Harbor in 1917. It was during Ladd's tenure that surgery of children changed from a tradition of periodic consultation by surgeons who primarily cared for adults to a full time discipline. Dr. Ladd began with only two beds loaned by the orthopedic service. At a time when most congenital malformations were considered "inoperable", he began to unravel the puzzles of intestinal malrotation, atresia of the esophagus, and cleft palate, first in the autopsy room and then in the operating room. During the next decade, three surgical wards were erected to keep pace with the need to house patients who were brought to the hospital as word spread that Dr. Ladd was saving children who were previously thought hopeless. The first addition, in 1930, was the Ida C. Smith Ward, which brought the number of surgical beds to 15. Twelve hundred operations were done that year.

Dr. Ladd became known as the founder of pediatric surgery and further recognition of this new specialty was given when the Harvard Medical School established the world's first chair in pediatric surgery in 1941, known as the William E. Ladd Professorship of Child Surgery. Dr. Ladd became the first incumbent and held this position until his retirement in 1945.

Dr. Robert E. Gross was appointed as Ladd's successor. There followed another extraordinary era in surgery at The Children's Hospital. By his successful pioneering approaches to the problems

of patent ductus arteriosus, coarctation of the aorta and vascular malformations in the mediastinum, Dr. Gross opened a whole new field of cardiovascular surgery. These innovations required study not only in the post-mortem room but also in the laboratory. Under Dr. Gross' inspiration, the surgical laboratories flourished and a succession of assistants came to work with him as new methods were worked out on animals and then applied clinically.

Dr. Gross's interests were wide and he made many other contributions throughout the field of general surgery. He extended the range of surgery for solid tumors and improved the surgical approach to omphalocele, epispadias, anomalies of the biliary tree and duplications of the intestine. This was a very productive period, for at the time of these accomplishments Dr. Orvar Swenson was also working out the mechanism and surgical therapy of Hirschprung's disease.

Standards Established

As report after report of well-managed cases with increasing survival rates appeared from the Children's Hospital, these became the standard by which other surgeons measured their efforts. A pattern of excellence was established; surgical residents from all over the country came to receive training in this new specialty. Although Dr. Ladd had appointed two interns and later one resident each year (through a cooperative program with the Peter Bent Brigham Hospital), it was under Dr. Gross' guidance that the residency program as we now know it, developed. In 1946 a two-year senior residency was begun; Dr. William Clatworthy was the first chief resident to complete this program. At this time there were four senior residents. In 1957 an arrangement was made with Dr. Francis Moore at the Peter Bent Brigham Hospital to send seven junior residents to The Children's Hospital each year. This Brigham-Children's relationship worked out admirably and the exchange of residents and students was beneficial to both surgical services. It was also during this period that the elective in pediatric surgery became one of the most popular in the Medical School; Dr. Donald MacCollum presided over the assignments of those students privileged to come on the service.

Because men who were chief residents under Dr. Gross had already completed the full residency in adult surgery, they were usually the best trained surgeons on the staff of any hospital where they worked. The new specialty was greatly respected. There resulted an enormous demand for such young

men to head up numerous departments of pediatric surgery throughout the country.

Having pioneered cardiovascular surgery in children, and then established the patterns of excellence in the general and urologic surgery of children, and having trained men to carry on this tradition, Dr. Gross then set all of this down in his now famous book, *The Surgery of Infancy and Childhood*. This volume became the bible of pediatric surgery and indispensable for any surgeon dealing with problems of the young patient. Like ever widening ripples of water, the influence of this book has continued to spread. Now published in four languages, it has made an impact throughout the world. There are children in every city alive today because of the judgment, experience and innovation so lucidly outlined by Dr. Gross.

As the only physician ever to receive two Lasker Awards and the first recipient of the coveted Dennis Browne Gold Medal, Dr. Gross continued to perfect cardiac surgery in children. He was joined by Dr. William Bernhard who adapted the hyperbaric chamber to improve cardiac surgery in the newborn and who then developed new methods for cardiac assist and replacement.

The scope of clinical and research activities of cardiac surgery increased to such an extent that the Trustees voted to create a new division called the Interdisciplinary Cardio-Vascular Center for Children under Dr. Gross' leadership. In order to accomplish the simultaneous strengthening of this new venture and at the same time to permit continued development of other areas in general surgery and the surgical specialties, another chair was created, the Julia Dyckman Andrus Professorship of Child Surgery. The appointee would also serve as Chief of the General Surgical Services. In July 1967, Dr. Judah Folkman was named to this position with an expression by the Trustees that a leave of absence from full administrative duties be given until research facilities were available. This would also allow Dr. Folkman to travel and to study additional pediatric surgical techniques before assuming this position full-time.

A new position of Administrative Chief of Surgery was created and this was superbly managed by Dr. Robert Filler. New organizational changes were made so that each staff member was responsible for the ward service two months out of the year and could work closely with the chief resident during that time. An annual professorship was initiated. Dr. Irving Meeker and Dr. Thomas Holder were our guests in 1967 and 1968 respectively. A Surgical Service Fund was established so that mem-

bers of the staff could vote on how to disburse fees collected from the supervision of ward cases. In the past year these funds were used to pay health insurance for our residents, enabled renovation of research laboratories and provided for the research of two medical students. These funds also provided a secretary for the chief resident and paid his way to two national surgical meetings. Additional donations from this source made to the hospital were used to help support other departments and to purchase needed equipment for the operating room.

Responsibility Assigned

Each staff member undertook additional responsibilities. Dr. Samuel Schuster continued as Director of Ambulatory Surgical Services, but because of the expansion of facilities in the new Fegan Building, Dr. Angelo Eraklis was asked to take charge of the new Out-Patient Clinic. The surgical emergency room census also increases and Dr. John Chamberlain assumed full-time supervision of this area. The Urology Clinic has been directed by Dr. Alan Perlmutter, assisted by Dr. Arnold Colodny. We look forward to an increasing development in urology under Dr. Perlmutter's guidance. We expect that in the future he will be joined by Fellows in Urology who are beginning to apply for both clinical and research training in this sub-specialty. Clearly, this discipline needs to be taught to both pediatric surgeons and urologists; development of these objectives by a urologist working full-time in a children's hospital seems to be the best approach. Dr. Colodny co-ordinated all student teaching; the fourth year clerkship has continued to be popular with Harvard students and is also sought by students from many other schools.

In addition, a number of recent new developments should be cited. Dr. Schuster's description of omphalocele repair with silicone rubber sheeting is now widely used. Drs. Filler and Birch performed the first two liver transplants in this hospital. A new method of intravenous hyperalimentation originally described by Dudrick of Philadelphia has been modified by Dr. Filler and used in more children than in any other hospital. Extensive metabolic studies have been carried out on these children by Eraklis' laboratory. This technique has already saved several children and should prove to be a major therapeutic advance. Dr. Perlmutter in conjunction with members of Dr. Schwachman's group described the absence of the vas deferens in males with cystic fibrosis. Drs. McCollum and Murray have begun to use prosthetics and new surgical techniques to improve palatal function in the few children who have severe speech difficulties after cleft

palate surgery. Dr. George Gifford has developed a special interest in hand surgery. Dr. Kenneth Welch completed the second edition of *Pediatric Surgery* of which he is one of four editors.

Dr. Folkman is working on the mechanism of tumor angiogenesis, new methods of chronic analgesia and blood gas analysis and prolonged perfusion of isolated organs. During 1969, Dr. Folkman will be at the Children's Hospital of Philadelphia for six months to take additional pediatric surgical training with Dr. C. Everett Koop.

Dr. Raphael Levey joined our staff this year after completing the Chief Residency in Surgery at the Massachusetts General Hospital. Recognized throughout the world of immunology for his work on thymus hormone and anti-lymphocyte serum, Dr. Levey was given a year's leave of absence to work in Sir Peter Medawar's Laboratory in London and also to study at Great Ormond Street. Upon his return in May, 1969, he will set up a transplantation program and his laboratory effort will focus upon transplantation and tumor immunology.

Dr. Luther Longino, after many years of devoted service, left to become Director of Pediatric Surgery in Dr. Kirklin's Department of Surgery at the University of Alabama.

The Future

What about the future? The challenges we face are foremost those presented by nature. Not a day passes in the care of our patients when nature does not baffle us in some way, make our skills seem useless and our science diminutive; we are left only with questions. But by posing them we become alert to potential solutions or possible experiments. The list of questions is long and assures enormous opportunity for future discovery and progress. For example, why do some tumors, and perhaps especially childhood tumors, excite and occasionally succumb to tumor specific immunity? Why do tumors continue to elicit new capillary blood supply, and can this be inhibited? How can we approach the problem of inappropriate blood vessel growth which leads to arterio-venous fistula of the limbs or multiple telangiectasia of the bowel? Can organ perfusion be so perfected that we might one day remove organs for prolonged in-vitro therapy and then return them to their original host? Can animal organs be used for transplantation, so that we can choose them to the appropriate size for our small patients? Is there any relationship between viral infection during pregnancy and atresia of the bowel and esophagus? What about chronic urinary and pulmonary infection? Can bacterial resistance to antibiotics be reversed by genetic alteration? Can

hemophilia be treated by spleen transplant? Where can we make the most progress in determining why newborns with diaphragmatic hernia have such severe respiratory problems. Can we learn to support small patients with an artificial lung or transplant a live one? Can we measure blood chemistries and blood gases without removing a blood sample? These problems and many more, are familiar to pediatric surgeons, but their solution would contribute to the entire field of surgery. It is not enough that we adapt adult surgical procedures to children and think that this is the extent of possible progress in our specialty.

In another sense we face a group of problems which will require a different approach over the next decade. These are not of nature but man-made. In some respects they are the problems of success because of the increasing demand that children who need surgical care have a surgeon with the best possible preparation. They raise the question of whether we should have Pediatric Surgical Boards. Are the reasons for having such Boards only to increase respect or to enlarge referral? Are these important enough? What is our role in the teaching of sub-specialties as urology and cardiac surgery? How many pediatric surgeons shall we train? Can we increase the teaching effectiveness of our residencies by including intensive although brief practice in technique in the post-mortem room or in the animal laboratory? Finally, what about investigation? For our field to remain viable and self-renewing, at least some of its leaders need to be versed in the art of investigation. We must be able to take advantage of the vast array of hints and clues which nature makes available to us. Our residencies are long and there is little time to learn this art. We do not propose to shorten the residency for fear of decreasing the quality of training, but we hope to make available opportunities for investigating early in medical school or after internship. We think it is possible to teach the art of investigation as one teaches the art of surgery. Men who have learned this art should continue to mature in their ability to plan investigations and to translate the results to the bedside.

As we try to resolve these problems we will test each one against our philosophy that a proper role for pediatric surgery is to develop any area where surgery will help children, to bring to bear upon it the best science and skill and establish for it a tradition of excellence and then to teach it to whoever would learn it. In the final analysis, any change which is proposed must be evaluated by the question: How will it benefit children?



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DEPARTMENT OF ANESTHESIA

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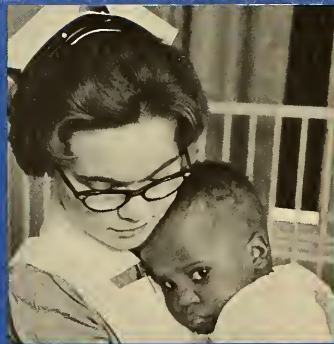
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